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SOME NOTES ON ELECTRIC LIGHT AND POWER DISTRIBUTION.

ELECTRIC TRANSMISSION.

By Daniel W. Mead, Consulting Engineer, Chicago, Ill.

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Electric transmission possesses many analogies to hydraulic transmission, and its conception in this way will aid materially in the comprehension of electric transmission phenomena by those familiar with hydraulics.

These analogies must not, however, be carried too far, as they do not hold in many cases.

1. In general, however, the units correspond as follows:

Unit of	*Electrical Units.*	*Hydraulic Units.*
Quantity.	Coulomb.	Gallon.
Time.	Second.	Second.
Current.	Ampere or (Coulomb per second).	Gallon per second.
Resistance or Friction.	Ohms.	Friction head.
Force.	Electric motive force or volt.	Head.
Power.	(Coulomb—second—volt.) (Ampere—volt) or watt.	Gallon—foot—second.
Work.	Watt hour.	Gallon—foot.

2. In electricity, a volt will force a current flow of one coulomb per second; or one ampere against an ohm resistance. This may be expressed as follows:

$$(1)\quad C = \frac{E}{R} \text{ in which}$$

C = the current in amperes,
E = the electro-motive force in volts,
R = the resistance in ohms.

Correspondingly, in hydraulics, a foot head will force one gallon against a friction head of one foot (velocity being neglected).

3. In both electricity and hydraulics, the resistance or friction in a conductor varies directly as its length; that is, if you double the length of a wire or a pipe, you double the resistance, and inversely.

4. In electricity the resistance is inversely as the cross-section of the conductor. In hydraulics, the resistance decreases as the cross-section increases, but not in direct proportion. In both cases, by increasing the size the resistance decreases.

The problem presented to the engineer is usually to investigate a circuit and to determine either its necessary dimensions, to limit the losses to a certain amount, or, in case of dimensions already determined, to investigate these losses.

Circular wires being used for conductors in electric transmissions, their area is calculated on the basis of circular mils. The circular mil is the area of a circle of a diameter of one one-thousandth of an inch. As the areas of circles are in direct proportion to the square of their diameters, the area of any wire in circular mils is at once ascertained by squaring the diameter measured in thousandths of an inch.

In simple or continuous current circuits, therefore, we have from the above consideration, the following equation for equilibrium:

$$(2)\quad E = \frac{K \times l \times C.}{A}$$

E = Electric motive force in volts,
C = Electric current in amperes,
K = The resistance per mil foot of the conductor,
l = The length of the wire in feet,
A = The area of the wire in circular mils.

As this is the equation for equilibrium, it also represents the loss in voltage necessary to force the current C through any given wire.

The ohm is defined by various bodies and differs slightly in its value by various au-

TABLE I. EQUIVALENT VALUES OF VARIOUS STANDARDS OF ELECTRICAL RESISTANCE, AT 0° C.

INTERNATIONAL OHMS.	LEGAL OHMS.	BRITISH ASSO. OHMS.	METER GRAIN SOFT COPPER *	METER-MILLIMETER SOFT COPPER *	MIL-FOOT SOFT COPPER *	FOOT GRAIN SOFT COPPER *	CU. CENTIMETER SOFT COPPER * MICROHMS	LENGTH OF A SQ. MM. MERCURY COL. OF EQUIV. RESIST. IN CMS.
1.	1.00233	1.01358	.14173	.0203	9.59	.20920	1.594	106.3
.99767	1.	1.01132	.14206	.02035	9.612	.20871	1.598	106.0
.9866	.9889	1.	.14365	.02057	9.72	.2064	1.616	104.8
7.0556	7.0392	6.9898	1.	.14334	53.747	1.4427		
49.261	49.249	48.764	6.9764	1.	472.414	10.064		
.10150	.10173	.10287	.014718	.002109	1.	.0212		
4.7808	4.7412	4.845	.69314	.09935	47.093	1.		

* RESISTANCE OF HARD COPPER = 1.0226 TIMES THAT OF SOFT COPPER.

thorities. Its equivalent relations are, however, shown in Table I.

The resistances of various substances which may be used as electrical conductors have been determined experimentally, and are given in Table II.

TABLE II.

SPECIFIC RESISTANCE OF METALS AND ALLOYS AT 0° CENTIGRADE, FROM DR. MATTHIESSEN'S EXPERIMENTS. (INTERNATIONAL OHMS.)

NAMES OF METALS.	Resistance of a wire one ft. long, whose diameter is one inch.	Resistance of one cubic centimeter to conduction between opposed faces.	Resistance of a wire one meter long and one millimeter in diameter.	Resistance of a wire one meter long, weighing one gramme.	Resistance of a wire one ft. long, weighing one grain.
	Ohms.	Microhms.	Ohms.	Ohms.	Ohms.
Copper annealed	9.5878	1.5943	0.02029	0.14207	.20363
Cop'r hard drawn	9.8068	1.6298	0.02075	0.14498	.20777
Aluminum, annealed	17.482	2.9055	0.03771	0.07468	.10704
Zinc press'd	33.761	5.6127	0.07147	0.40125	.57528
Iron ann'l'd	58.308	9.6933	0.12342	0.75514	1.0823
Lead pres'd	117.79	19.584	0.24921	2.2267	3.1926
Mercury liquid	570.84	98.403	1.2083	12.885	18.469
German silver, hard or ann'l'd	125.61	20.886	0.26589	1.8252	2.6164

It will be noted that the resistances mentioned in Table II are given at the temperature of freezing water. Temperature has a marked effect on resistance, which increases as the temperature increases. The ratios given in Table II, therefore, do not hold at all temperatures.

As copper is the most widely used metal for electrical circuits, its resistance has been more carefully determined, and is given in detail in Table III, for each 10° rise in temperature.

TABLE III.

TEMPERATURE COEFFICIENTS AND MIL-FOOT RESISTANCES IN INTERNATIONAL OHMS OF PURE SOFT COPPER FOR FAHRENHEIT TEMPERATURES ACCORDING TO MATTHIESSEN'S FORMULÆ:

Temp. in Degrees Fahr.	Temperature Coefficient of Resistance.	Resistance per Mil-foot International Ohms.
32	1.	9.5900
40	1.01732	9.7561
50	1.03929	9.9668
60	1.06160	10.1807
70	1.08424	10.3979
80	1.10716	10.6177
90	1.13034	10.8399
100	1.15376	11.0645
110	1.17740	11.2912
120	1.20126	11.5201
130	1.22534	11.7510
140	1.24965	11.9841
150	1.27394	12.2170
160	1.29811	12.4488
170	1.32221	12.6799
180	1.34621	12 9101
190	1.37011	13.1393
200	1.39391	13.3676
210	1.41760	13.5948
212	1.42231	13.6399

From Table III the resistance of the wire at any desired temperature can be ascertained, and when the length of wire in a simple circuit is known, and the current

BRICK PAVEMENT ON DAVIS SQUARE, SOMERVILLE, MASS.

strength to be transmitted is given, these values can be substituted in equation (2) and the line loss easily calculated.

In most of the tables in use, the resistance is calculated at a definite mil-foot resistance, which is taken at from 10.5 to 11, and is considered good for all ordinary conditions. In such case, the formula will take the form:

$$(3)\quad E = \frac{10.8 \times l \times C}{A}$$

In some cases, the distance one way only is measured, and as this gives only one-half of the actual wire, the mil-foot resistance is doubled in such formula, which will give the form:

$$(4)\quad E = \frac{21.6 \times L \times C}{A}$$

in which L = distance from generator to point where current is used (or $\frac{1}{2}l$).

The following diagram gives a graphical solution of this form of problem without computation:

In alternating currents, the above simple rules do not hold. With these currents the conditions are such that the resistances are not only in proportion to the current, but depend on the nature of the work the current is called upon to perform, and on the size of the wire as well. The nature of the work done determines the "power factor" in each case, and on this the resistance is based. The power factor varies approximately, as follows:

Service.	*Approximate Power factor per cent.*
All incandescents	100
Incandescents and arcs	95
Incandescents and a few motors	90
Half incandescents and half motors	85
All motors	80

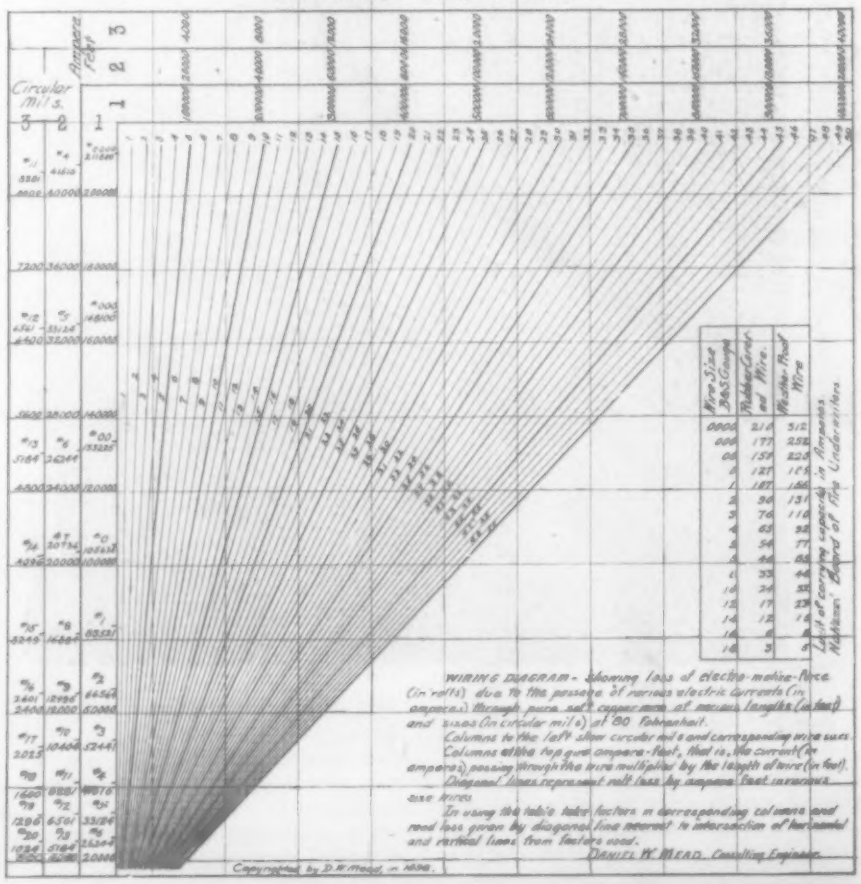
For alternating currents, the following formulæ have been found to be practically correct:

$$(5)\quad A = \frac{K \times l \times c}{2P}.$$

$$(6)\quad E = P\,M.$$

$$(7)\quad C = c\,T.$$

WIRING DIAGRAM.


Amperes
Circular Mils.
Wire Size B&S Gauge
Rubber Covered Wire.
Weather Proof Wire
Limit of carrying capacity in Amperes. Rubber Board of Fire Underwriters
WIRING DIAGRAM - Showing loss of electro-motive force (in volts) due to the passage of various electric currents (in amperes) through pure soft copper wire of various lengths (in feet) and sizes (in circular mils) at 80 Fahrenheit.
Columns to the left show circular mils and corresponding wire sizes.
Columns at the top give ampere-feet, that is, the current (in amperes) passing through the wire multiplied by the length of wire (in feet).
Diagonal lines represent volt loss by ampere feet in various size wires.
In using the table take factors in corresponding columns and read loss given by diagonal line nearest to intersection of horizontal and vertical lines from factors used.
DANIEL W. MEAD, Consulting Engineer.
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BROADWAY ASPHALT PAVEMENT, SOMERVILLE, MASS.

In the above, the letters have the following significance:

A = area of wire in circular mils.

l = total length of wire.

L = distance from source of current to point of application, or $\frac{1}{2}$l.

P = line loss in volts between generator and consumer.

e = volts actually delivered to consumer.

E = volts actually lost in line.

c = current actually delivered to consumer.

C = current in main conductor.

W = Watts actually delivered = E×C.

K = the mil foot resistance assumed (always equal to 10.8 for continuous currents).

M & T = constants always equal to 1 in continuous currents.

The values of K T & M, are given in Tables IV and V.

It will be noted in the wiring formulas that the losses vary in each case as l×C, or as the length of wire multiplied by the current carried; that is, the loss in each case is proportional to what may be termed the ampere feet.

In distribution systems it is often important to carry a uniform voltage over a considerable area, hence the wiring must be calculated for a uniform loss of voltage or drop. From formula (3) the size of wire is determined as follows:

$$(8)\quad A = \frac{10.8 \times l \times C}{E}$$

in which E is the voltage lost, or drop in the wire in passing a current C through a length l.

To determine the size of wire for a uniform drop, multiply the ampere feet by the constant given in Table VI. The last col-

TABLE IV.

	Value of K.					Value of T.				
Power Factor	100	95	90	85	80	100	95	90	85	80
Continuous Current	10.8	.....	.....	.....	.....	1.	.....	.....	.....	.....
Alternating Current:										
Single-phase	10.8	12.0	13.3	15.0	16.9	1.	1.05	1.11	1.17	1.25
Two-phase (four wire)	5.4	6.00	6.65	7.5	8.45	.50	.53	.55	.59	.62
Three-phase (three wire)	5.4	6.00	6.65	7.5	8.45	.58	.61	.64	.68	.72

TABLE V.

No. of Wire B & S. Gauge	Area of Wire Circular Mils	Weight of Bare Wire per 1000 Ft. in Lbs.	Resistance of Wire per 1000 Ft. at 20°C in Ohms.	Values of M														No. of Wire B & S. Gauge
				25 Cycles				40 Cycles				60 Cycles				125 Cycles.				
				Per Cent Power Factor				Per Cent Power Factor				Per Cent Power Factor				Per Cent Power Factor				
				95	90	85	80	95	90	85	80	95	90	85	80	95	90	85	80	
0000	211,600	640.5	.04979	1.23	1.29	1.33	1.38	1.40	1.53	1.61	1.67	1.62	1.84	1.99	2.09	2.35	2.86	3.24	3.49	0000
000	167,800	508.0	.06284	1.18	1.22	1.24	1.29	1.32	1.41	1.48	1.51	1.49	1.66	1.77	1.85	2.08	2.48	2.77	2.94	000
00	133,079	402.97	.07928	1.14	1.16	1.16	1.16	1.25	1.32	1.35	1.37	1.34	1.52	1.60	1.66	1.86	2.18	2.40	2.57	00
0	105,592	319.74	.09975	1.10	1.11	1.10	1.09	1.19	1.24	1.26	1.26	1.31	1.40	1.46	1.49	1.71	1.96	2.13	2.26	0
1	83,694	253.43	.1334	1.07	1.07	1.05	1.03	1.14	1.17	1.18	1.17	1.24	1.30	1.34	1.36	1.56	1.75	1.88	1.97	1
2	66,373	200.98	.1682	1.05	1.04	1.02	1.00	1.11	1.12	1.12	1.10	1.18	1.23	1.25	1.26	1.45	1.60	1.70	1.77	2
3	52,633	159.38	.1962	1.03	1.02	1.00	1.00	1.07	1.08	1.07	1.05	1.14	1.17	1.18	1.17	1.35	1.46	1.53	1.57	3
4	41,742	126.40	.2473	1.02	1.00	1.00	1.00	1.05	1.06	1.03	1.00	1.11	1.12	1.11	1.10	1.27	1.35	1.40	1.43	4
5	33,102	100.23	.3120	1.00	1.00	1.00	1.00	1.03	1.01	1.00	1.00	1.08	1.08	1.06	1.04	1.21	1.27	1.30	1.31	5
6	26,250	79.49	.3934	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.00	1.05	1.04	1.02	1.00	1.16	1.20	1.21	1.21	6
7	20,816	63.03	.4958	1.00	1.00	1.00	1.00	1.01	1.00	1.00	1.00	1.03	1.02	1.00	1.00	1.12	1.14	1.14	1.13	7
8	16,509	49.99	.6250	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.02	1.00	1.00	1.00	1.08	1.10	1.09	1.07	8
9	13,100	39.70	.7886	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.06	1.06	1.04	1.02	9
10	10,381	31.50	.9940	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.03	1.00	1.00	10

WIDE TIRES ON SOMERVILLE, MASS., MACADAM.

WIDE TIRES ON SOMERVILLE, MASS., MACADAM.

umn gives the constant for cases where the distance one way only is used.

TABLE VI.

Loss in volts.	Constant for l.	Constant for L.
1	10.8	21.6
2	5.4	10.8
3	3.6	7.2
4	2.7	5.4
5	2.16	4.32
6	1.8	3.6
7	1.54	3.09
8	1.35	2.7
9	1.2	2.4
10	1.08	2.16
11	.98	1.96
12	.90	1.8
13	.83	1.66
14	.78	1.56
15	.72	1.44
16	.68	1.36
17	.64	1.28
18	.60	1.20
19	.57	1.14
20	.54	1.08

The following tables for wiring calculation are both accurate and easy of application:-

TABLE VII.

Size wire required, per 1,000 ampere feet, with any given loss.

Volt Drop.	Circ. Mils.	Volt Drop.	Circ. Mils.
1.	21,600	7.5	2,880
1.25	17,280	8.	2,700
1.50	14,400	8.5	2,540
1.75	12,343	9.	2,400
2.	10,800	9.5	2,273
2.25	9,600	10.	2,160
2.50	8,640	11.	1,964
2.75	7,854	12.	1,800
3.	7,200	13.	1,660
3.5	6,170	14.	1,542
4.	5,400	15.	1,440
4.5	4,800	16.	1,350
5.	4,320	17.	1,270
5.5	3,927	18.	1,200
6.	3,600	19.	1,136
6.5	3,323	20.	1,080
7.	3.084		

To obtain ampere feet for use in above table, multiply distance of transmission (one way) by amperes (based on the watts divided by the volts) delivered at consumer's end of line.

Use 2 wires of above dimensions for direct current, or single-phase.

Use 4 wires of ½ above dimensions for two-phase.

Use 3 wires of ½ above dimensions for three-phase.

For 95 per cent. power-factor increase size of wire 11 per cent.

For 90 per cent. power-factor increase size of wire 23 per cent.

For 85 per cent. power-factor increase size of wire 38 per cent.

For 80 per cent. power-factor increase size of wire 56 per cent.

Should size of wire exceed No. 2 B & S at 25 cycles, or No. 4 B & S at 40 cycles, or No. 6 B & S at 60 cycles, or No. 9 B & S at 125 cycles, consult Table IV.

After the size wire is calculated as above for the current to be transmitted, such a wire must be selected as can be commercially obtained, and, as the calculated and commercial sizes will seldom agree, the size next larger should be selected, unless the next smaller size is very near the required capacity. Table VIII gives the principal data concerning copper conductors in common use.

Not only economy of operation must govern the selection of the size of wire, but heating limits as well.

The resistance in a wire causes the wire to heat; hence it has been found necessary to limit the size of wires which shall be used to carry various currents. The limits set on such wires by various insurance regulations are shown in Table IX.

TABLE IX.

HEATING EFFECTS OF CURRENTS—LIMIT OF CARRYING CAPACITY IN AMPERES, FROM RULES OF VARIOUS INSURANCE COMPANIES.

Numbers, B. & S. Gauge.	Current, the double of which will cause a rise of 72° F.	National Electric Light Association.	National Board of Fire Underwriters.		Associated Factory Mutual Insurance Company.	Phœnix Fire Insurance Company and Board of Trade Rules of England.
			Concealed work.	Open work.		
0000	174	175	218	312	175	.....
000	146	145	181	262	145	.....
00	123	120	150	220	120	105
0	103	100	125	185	100	83
1	88	95	105	156	85	66
2	73	70	88	131	70	52
3	61	60	75	110	60	41
4	52	50	63	92	50	33
5	43	45	53	77	45	26
6	36	35	45	65	35	21
7	31	30	.....	.....	30	16
8	26	25	33	46	25	13
10	18	20	25	32	20	8
12	13	15	17	23	15	5
14	9	10	12	16	10	3
16	6	5	6	8	5	2
18	5	.....	3	5	3	1

In addition to these limits the insurance companies and the larger municipalities issue certain regulations concerning the installation of electric wires in buildings, which should be carefully examined by

TABLE VIII. ELECTRIC LIGHT CONDUCTORS.

NO. OF WIRE B. & S. GAUGE	DIAMETER. MILS.	SQUARE OF DIAMETER. CIRCULAR MILS	WEIGHT OF BARE WIRE LBS. PER 1000 FT	WT. OF BARE WIRE LBS. PER MILE.	WT. WITH WEATHER PROF INSULATION. LBS. PER 1000 FT.	WT. WITH WEATHER PROF INSULATION. LBS. PER MILE.	FT. OF BARE WIRE IN 1 POUND.	FT. OF INSULATED WIRE IN 1 POUND.	RESISTANCE OF PURE COPPER AT 75° F. OHMS PER 1000 FT	RESISTANCE OF PURE COPPER AT 75° F. OHMS PER MILE	FEET OF WIRE FOR 1 OHM OF RESISTANCE	RESISTANCE OF PURE COPPER AT 75° F. OHMS PER POUND.
0000	460.000	211600.0	639.33	3359	758	4000	16	1.25	.04906	.25903	20383	.0000767236
000	409.640	167805.0	507.01	2663	666	3500	2.0	1.78	.06186	.32664	16165	.0001 2039
00	364.800	133079.4	402.09	2112	492	2600	25	2	.07801	.41187	12820	.0001 9413
0	324.950	105592.5	319.04	1661	385	2036	32	2.5	.09831	.51909	10409	.0002 0772
1	289.300	83694.2	252.88	1328	308	1628	4	3.25	.12404	.65490	8062.3	.0004 8394
2	257.630	66373.0	200.54	1069	260	1310	5	4	.15640	.82582	6393.7	.0007 8045
3	229.420	52634.0	159.03	835	201	1060	6.3	5	.19723	1.0411	5070.2	.0012 406
4	204.310	41742.0	126.12	662	163	862	8	6	.24869	1.3131	4021.0	.0019 721
5	181.940	33102.0	100.01	526	134	706	10	7.5	.31361	1.6558	3188.7	.0031 361
6	162.020	26250.5	79.32	417	110	577	12.6	9	.39546	2.0881	2528.7	.0049 868
7	144.280	20816.0	62.90	330	90	475	16	11	.49871	2.6331	2005.2	.0079 394
8	128.490	16509.0	49.80	262	74	392	20	13.5	.62881	3.3201	1590.3	.012608
9	114.430	13094.0	39.56	208	62	328	25	16	.79281	4.1860	1261.3	.020042
10	101.890	10381.0	31.37	165	52	275	32	19	1.	5.2800	1000.0	.031828
11	90.742	8234.0	24.81	131	44	231	40	22.75	1.2607	6.6569	793.18	.050682
12	80.808	6529.9	19.73	103	36	193	51	27.25	1.5898	8.3940	629.02	.080585
13	71.961	5178.4	15.65	82	31	162	64	32.5	2.0047	10.585	498.83	.1284
14	64.084	4106.8	12.41	65	26	135	81	39.	2.5908	13.680	385.97	.20830
15	57.068	3256.7	9.84	52	21	111	102	47.5	3.1150	16.477	321.02	.31658
16	50.820	2582.9	7.81	41	18	96	129	55	4.0191	21.221	248.81	.51501

every one before such installations are attempted. Copies of these rules can be had for the asking from the fire underwriters' association.

PUBLIC WORK IN SOMERVILLE, MASS.

The city of Somerville, Mass., is a suburb of the city of Boston, with a population of 62,000, and 91 miles of streets, 29 of which are said to be private streets. They vary in width from 4 feet to 200 feet, nine being less than 10 feet in width, and eighteen more than 50 feet wide. The length of public streets is 326,000 feet, and of private streets is 154,000 feet. The report of the street commissioner does not state how many of these streets are paved, but as 17,031 linear feet on 23 streets were paved in some manner during 1900, it is evident that there is some paving in use. The illustrations of the brick paving on Davis square and of the construction of the asphalt pavement on Broadway, which accompany this article, are the only indications in the report of the kinds of pavement in use in the city. Brick paving has not been popular in New England, largely because the freight charges on brick of proper quality have made the cost excessive in comparison with other good materials. Tar macadam is considered by the street commissioner to be worthy of investigation, and he gives an abstract of the Hamilton, Ont., specifications in his report.

He also calls special attention to an act of the Massachusetts Legislature which goes into effect January 1, 1902, requiring that on all wagons and carts whose axles are more than two inches in diameter, and on all large passenger vehicles, the tires shall be not less than one and one-half times the diameter of the axle at the shoulder, no tire being required to be more than four inches in width. The effect of such tires and of setting wheels to run in separate tracks is shown by two of the accompanying illustrations.

An example of the improvement in the architecture of city bridges, to be added to those noted in our pages last month, is shown in the views of the old Boston avenue bridge, supported on piers of an old canal

viaduct, and of the new granite arch which supersedes it. This arch was constructed under the supervision of the street commissioner, John P. Prichard, on plans by City Engineer E. W. Bailey, and was paid for jointly by Somerville, Medford, and the Boston Elevated Railway Company, the corporations interested. Another arch extended

JOHN P. PRICHARD,
STREET COMMISSIONER, SOMERVILLE, MASS.

and improved by the street commissioner is shown in the view of Broadway bridge and wall.

Under the new city charter the street commissioner is a member of the board of public works. The present incumbent brings to his work a long experience in charge of street departments in the cities about Somerville. Another member of the board of public works is the water commissioner. The present incumbent, Frank E. Merrill, is the first single commissioner and assumed his office in January, 1900.

The total possible income and credits to the water-works for the year 1900 was $223,367.57. Of this amount $138,691.74 was expended for maintenance, extension, interest, bonds and water furnished by the Metropolitan water-works board, while $47,391.12 was paid for sewer maintenance, construction, interest and bonds. Abatements made on water bills for amounts charged to city departments, etc., indicate that the city not only enjoys this large contribution to its expenses but does not pay its full share of the cost of furnishing the water used. If all the income of the water department were devoted to the department itself the bonded indebtedness could be paid in less than three years. These facts suggest the inquiry, whether the users of water should be required to pay so much more than the water costs, thus relieving property which should pay for sewers and for fire protection of its proper share of such expense. A slight reduction of rates is to be made to equalize rates rather than to reduce the income.

It seems possible, however, that the assessments for cost of supplying water made by the Metropolitan water board, which now supplies the city of Somerville, will be materially increased, in which case the surplus of revenue would be largely diminished.

In Mr. Merrill's report the water income is put in the form of bills rendered, but there is no statement of how much of the amount remained unpaid. Over $12,000 of bills for the previous year, paid during 1900, is, however, added to the income for the latter year, indicating either that all the bills rendered in 1900 were paid or that the "water income" is unduly swelled by prospective payments not yet actually in hand.

The buildings occupied by the pumping machinery formerly in use are now in charge of the commissioner of public buildings and a pump is kept in readiness for use if necessary. The buildings and grounds are shown in two of our illustrations, one showing the use made of the pool or basin two days in the week.

The movement toward uniformity and completeness of municipal accounts has not yet reached this city. The various members of the board of public works still make sep-

F. E. MERRILL,
WATER COMMISSIONER, SOMERVILLE, MASS.

arate reports, as though every department were absolutely independent, although the new charter unites the heads of the departments in the board of public works.

In some lines the information furnished is so meager and the omissions are so numerous, that a complete view of the work of the department is not obtained. The mak-

NEW BOSTON AVENUE BRIDGE, SOMERVILLE, MASS.

ing of separate reports to the mayor and council also separates the departments, so that it is difficult to correlate the work. More unity of action in making and in publishing reports would make all the reports more consistent and would probably reduce the expense of making them, but, most important of all, would vastly increase their value to the taxpayer and the student of municipal operations. When the board of public works becomes accustomed to its duties in their new form, this matter will doubtless receive the close attention which it deserves.

OLD BRIDGE OVER MYSTIC RIVER, SOMERVILLE, MASS.

AN ELECTRIC STREET SWEEPER.

By Waldon Fawcett, Washington, D. C.

There has lately been placed in service in the city of Cleveland an electrically-propelled street sweeper, which is unique, and which will greatly aid in the cleaning of streets which are traversed by electric railways. Prior to the introduction of this piece of apparatus the municipal government of the Forest City entrusted the work to contractors operating the ordinary horse-drawn sweepers, and of late years the expenditure for this form of cleansing has averaged about $1 a square. By the employment of the new machine the work is performed more effectively than before at 20 cents a square, and in addition to the economic advantages from a monetary standpoint there is entailed a saving of time which is of distinct benefit on the more congested thoroughfares.

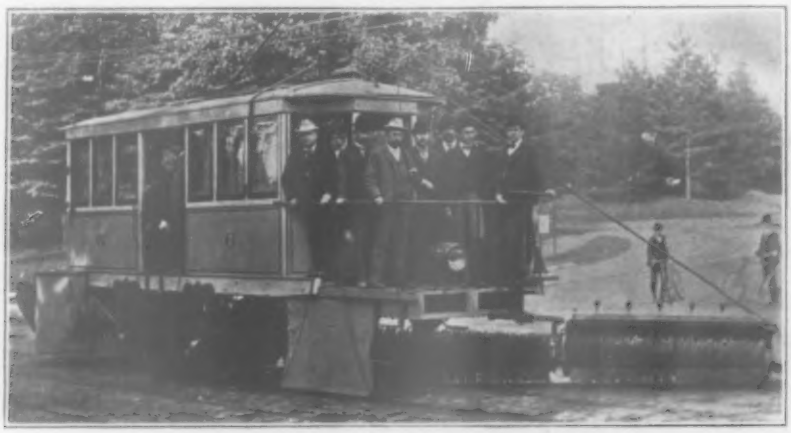
The newly-installed sweeper is primarily the idea of Hon. Tom Johnson, the present mayor of Cleveland, whose long experience in the affairs of street railroads enabled him to pass intelligently upon the practicability of the plan. The machine was constructed at the shops of one of the local street rail-

BROADWAY BRIDGE AND WALL, SOMERVILLE, MASS.

way systems under the immediate direction of Ira McCormick, the general manager, and represents an expenditure of $2,800, although it is claimed that duplicates may now be provided at much less cost. A special car of particularly staunch construction was built in Philadelphia and shipped to Cleveland, and with this as a foundation experiments were made by placing brushes in different positions until a satisfactory arrangement was devised.

At the forward end of the car is a revolving brush which sweeps half of the space between the rails on which the sweeper is traveling and the "devil strip," or space intervening between the two parallel tracks of the ordinary double-track system. At the rear end of the car is an immense revolving brush, sixteen feet in length, which cleans a space of ten feet on either side of the car tracks, which is sufficient for practically any street in Cleveland, and it is claimed that this radius might be extended considerably simply by the provision of longer brushes.

In order to obviate the disagreeable effect of the immense clouds of dust which would naturally be raised by a sweeper of such size, the machine is preceded by a large sprinkling car constructed expressly for the purpose. This sprinkler has a capacity of 5,000 gallons of water, is provided with spraying devices, which scatter the water over the entire street, and may be operated for miles without the necessity of delay for replenishing the water supply. Tests with the sprinkler as an adjunct have proven that pavement may be cleaned much more



ELECTRIC STREET SWEEPER.

the remainder of the space between the rails and the expanse of pavement, ten or twelve feet in width, intervening between the outer rail and the curbstone. This latter brush serves to pile the dirt and refuse in a long furrow close to the curb, whence laborers with shovels may readily transfer it to the wagons.

The brushes are operated and the car is propelled by current taken from the wire over the track by the trolley pole. The brushes are revolved by means of the current from a thirty-five-horse power motor, separate from that which furnishes power for the propulsion of the car. At the rear of the sweeper mechanism is provided, operated by a brake-wheel and levers, for raising the brushes and swinging them out of the way behind the car when it is not desired to operate them. The sweeper cleans readily and thoroughly when moist than when dusty.

Some really remarkable trials have been made with this new sweeper. For one thing the brushes are so flexibly arranged that they follow all the inequalities of a pavement and take up every particle of dirt. Indeed, the new machine has demonstrated its ability to pick up a pin on the street. The machine on one occasion swept a long stretch of Broadway, probably the dirtiest street in Cleveland, at the rate of seven miles an hour, and the city officials who were present at the test claim that the street was fully one hundred per cent. cleaner after the electric machine had passed over it than it would have been possible to make it through the exertions of men with scrapers and hand-brooms.

The city authorities at Cleveland have

WATER DEPARTMENT BUILDINGS AND POOL, SOMERVILLE, MASS.

entered into an arrangement whereby this sweeper will be operated regularly every night. If desired, a speed of ten miles an hour may be maintained. The street railway system on which the electric sweeper was first introduced, has over one hundred miles of tracks and another city line contributes to the aggregate trackage in the city, but the new machine is to be operated over all lines. It is estimated that every street in the city on which there are tracks can be traversed at least twice a week. Inasmuch as a clause in the franchises of the street railroads compels the operating companies to keep their tracks clean, the cost to the city of cleaning streets by this new method will be even less than one-fifth what it has heretofore expended for the same service.

The accompanying photograph shows the machine ready for operation.

EDITORIAL COMMENT.

Electrolysis and Insurance Rates. The effect of stray currents from electric railway lines in corroding water and gas mains is likely to have one result which will directly affect every property owner in the cities where methods of construction are permitted which allow such vagaries of the returning current. The national bureau of underwriters has taken up the question of the effect of the deterioration of water mains upon the fire protection of cities, and, in at least one instance, through the state inspection bureau, has recommended a very material increase in insurance rates. This case is the city of Dayton, Ohio, in which the increase is reported to be from 60 to 75 per cent., presumably on this account largely, if not entirely. Similar conditions exist in other cities, and when the dangers warrant the increase in insurance rates the inspection bureaus will not hesitate to make it. The prominence given to the Dayton case two or three years ago by the full discussion of it possibly tends to exaggerate the dangers there in proportion to those in other cities, not by exaggerating the Dayton dangers so much as by minimizing those in other cities.

When new franchises are granted to city railway companies or to interurban lines passing through the smaller cities and towns, too much care can not be taken in providing for this matter. If the courts succeed in establishing the doctrine of the liability of the electric railway companies as developed in the report of Mr. Wean, master in chancery, on the Peoria case, there will be no question of the ability of private water or gas companies to collect damages for injuries to pipe lines and accidents resulting therefrom, and perhaps to enjoin further operation under a system which makes the objectionable current action possible. In case of public water supplies, however, especially where new franchises are granted with knowledge of the possible effect of certain methods of current transmission in producing electrolysis of pipes, it is conceivable that some decisions might hold that the license to run under these methods tacitly bound the city to suffer the consequences of their use. At any rate it is better to safeguard the matter by adding to the franchise agreement a clause requiring the railway companies to assume all damages from injuries due to their methods of operation and to change their methods when the city decides that this is not satisfactory.

If the pockets of the large taxpayers are directly affected by an increase of one-half in their insurance rates they will soon develop enough interest in the matter to push the correction of the existing evils to an early settlement.

Baltimore Pavements. A Correction. It is not often found necessary to make a correction of an item in the department of current information, our news service being more than usually satisfactory in accuracy of detail. City Engineer B. T. Fendall, of Baltimore, states that he is misquoted on page 39 of the July number in a quotation from a Washington daily paper purporting to give in his exact words his opinion of asphalt block paving. Mr. Fendall states that he has no recollection of making any such statement, and that he takes particular pains not to indorse or condemn any paving material or system of paving, referring inquirers to the statements of cost of paving and mainte-

ARTIFICIAL POOL IN USE, WATER DEPARTMENT, SOMERVILLE, MASS.

nance through several years which appear in his annual reports, and preferring that they draw their own conclusions from these data. We take pleasure in making this statement for Mr. Fendall.

In this connection, it may be of interest to give the cost of repairs of asphalt blocks, taken from Mr. Fendall's last report.

The first column gives the date of expiration of the guaranty upon the pavement, the second the cost of the repairs per square yard per year to January 1, 1901. The original cost of all the pavements named in the table was $2.50 a square yard.

Guaranty expired.	Cost of repairs per square yard per year.
1881	0.0815
April 13, 1885	0.085
July 26, 1885	0.0673
April 12, 1886	0.2101
May 10, 1886	0.0004
June 11, 1886	0.0013
May 4, 1885	0.0235
June 21, 1888	0.0082
July 22, 1888	0.0444
1889-1890	0.127
Oct. 23, 1894	0.05
May 20, 1893	0.0897
Nov. 4, 1895	0.0102

There is an increasing demand for brick pavements in Baltimore. To satisfy the need of testing apparatus the highways division of the Maryland Geological Survey, under the charge of Prof. A. N. Johnson, has set up a standard rattler of the N. B. M. A. pattern and apparatus for testing the cross-breaking strength of brick. The results of many tests of brick from Maryland, Pennsylvania, West Virginia, Ohio and New York, are printed in the city engineer's report.

Form of Paving Brick Surface.

A correspondent calls attention to a point in relation to which he thinks specifications for brick pavements are not sufficiently definite, namely, the provision of space for the filler between the bricks, stating that he would require letters or other projections of one-eighth inch height on one side of each brick, this being preferable to indentations as the filler can enter the space when the bricks are thus separated.

The latest designs for repressed brick surfaces provide both projections and indentations, the former of less height than one-eighth inch, as both sides of the brick are so moulded that turning of the brick may not be necessary in laying. With cement filler it is hardly likely, under ordinary methods of laying brick, that even flat surface repressed bricks will be so close together that the filler can not get into place. With bituminous fillers, especially in cold weather, this difficulty may be met with. Extreme caution must be used in selecting brick with such projections, as it is very easy to force the bricks so far apart that wear of the edges will be materially hastened and the life of the pavement thereby shortened. This will be true especially of bituminous and sand fillers if the street surface is kept clean. Ordinary brick, not repressed, have enough unevenness of surface to reduce the difficulty of too narrow joints almost to zero.

Heat of Pavements.

The unusual degree of temperature reached during the summer and the long continuance without rain have affected all kinds of pavements. In the city of Boston some experiments were made to determine the temperatures to which various paving materials were raised by the action of the sun. The details of the experiments are not now at hand, but the resulting figures are of interest. The average temperature of macadam was found to be 102 degrees, of asphalt 113 degrees, of granite 115 degrees, and of wood 124 degrees. These figures must be accepted with caution, in the absence of full information regarding the conditions of the experiments, and show, presumably, the temperatures of the air immediately above the pavement surfaces. Brick is not included in the list, as there is very little brick pavement in the city of Boston. An extension of the experiment to cement, stone, brick and bituminous sidewalks would be of interest.

The effect of the heat upon some of the kinds of pavement has been very marked. The lack of cohesion and elasticity in macadam pavements has prevented any serious effects upon this class of pavements, the only increase in wear being on streets not sprinkled, where the travel produced a greater quantity of dust than usual, and greater roughness of surface with the same travel was therefore observed. The many joints in granite pavement, the low co-effi-

cient of expansion, and the elastic nature of joint filling prevented increase in injury to this class.

Many asphalt pavements were rendered soft by the excessive heat so long continued, and a few were injured by heavy travel when in this condition, but a large proportion returned to their usual condition under the action of the traffic as the heat diminished. In some of the older pavements there was some indication of an excessive drying out of the oily or softening ingredients of the pavement, which may result in disintegration when cold weather comes.

Brick pavements with bituminous or sand filler in joints seem to have been affected by the heat but little, if any. There are several instances of explosions of brick pavements, which are attributed to the heat. Numbers of such explosions are reported from Trenton, N. J., and Kansas City, Mo. In Kansas City the explosions occurred at points from which water flows in both directions, or where a steep grade at the top of a hill changed to a flat grade. This indicates expansion lengthwise of the pavement in the direction of least resistance and the localization of the explosion at the point where there is the best opportunity for upward movement. The pavements which have exploded have presumably cement filled joints, though this is not always definitely stated in the reports.

Any expansive effect which heat may have upon wood was much more than overcome by the contraction due to the drying out of the blocks, and, during the dry weather, the joints of these pavements opened, showing large space between blocks. In pavements which were swept regularly these spaces were filled more or less completely with the street dirt. When rain came the blocks again swelled, and as a consequence pavements rose wherever any local relief in a vertical direction of the horizontal pressure was possible. This usually occurred at ends of pavement, at manholes or other similar structures in the street and on alley and street wings.

These exceptional occurrences may perhaps be put under the "acts of Providence" which can not be foreseen, or which occur so seldom that provision for them would cost more than the damage resulting from their neglect. Some suggestions regarding treatment of pavements during hot weather arise from a consideration of the experience of the past summer which are worthy of attention. One of these is the matter of sprinkling or washing streets. In all cases of expansion from heat, the tension could be greatly relieved by systematic sprinkling, beginning before the heat of the day and continuing until the highest temperature is reached. This would prevent the cumulation of heat in the pavement from day to day by removing the maximum effect of the heat before it was absorbed by the wearing surface. Similar effect could be obtained by thoroughly washing the streets at night, using much more water than would be needed for the day sprinkling. Perhaps this night washing would be the more satisfactory in the case of asphalt, as with this material the removal of the stored heat is what is most desired, and the street would be cleaned as well as cooled. For wooden pavements the drying out of the blocks can be prevented by the proper use of water. Sprinkling does not look so promising in this case as a remedy. A resort to flushing the streets at night as a means of cleaning, instead of sweeping, would serve both to clean the street and to supply it with the requisite amount of water, and would not give rise to the objectionable odors which arise from a sprinkled wooden street, no matter how clean it is kept. It is probable that street flushing will become more popular as a result of the summer's experience, being restricted to the warmest part of the season where the water supply is not ample or is expensive.

The Techno-Lexicon.

The German Society of Engineers has taken up a work which is very extensive and will cost much money, but which will be well worth whatever it may cost. This work is the preparation of a technical dictionary, giving the definitions of technical terms and their equivalents in German, English and French. The work will appear in three volumes, one for each of the languages mentioned as the argument.

The German Society of Engineers expects to pay the expenses of the editorial and printing departments, depending upon the sale of books to reimburse it. The co-operation and collaboration of all technical societies and colleges, of corporations and individuals is desired that the lists of words

may be as complete as possible and the definitions may cover all the uses of the terms. It is very properly expected that this information will be furnished without charge. Dr. Hubert Jansen, Berlin (N. W. 7) Dorotheenstrasse 49, is the editor and will furnish the preliminary blanks for reporting words and definitions upon request.

The importance of this work and the necessity of universal co-operation can not be emphasized too strongly. We hope our readers will make their contributions, whether of a single word or of thousands, to the editor promptly. One object being to record all local variations of terms, full descriptions of the local meaning of names of technical tools and operations, from trench-digging up, are especially desirable, and every one can add something to the stock of knowledge by recording those terms and descriptions which specially interest him, and forwarding them to Dr. Jansen.

Methods of Granting Franchises.

A correspondent states that the trustees of his village induced private citizens to erect a plant for public and commercial lighting, and granted them a franchise giving them certain rights to the streets, but after the plant was in running order gave the contract for the public lighting to another individual, thus causing heavy loss to the owners of the first plant. He wishes to know what the legal responsibilities of the trustees are in such case. Evidently it is a case for the courts to decide after a careful consideration of the evidence upon both sides; but the occurrence gives texts for a number of discussions of the irresponsibility of village trustees and city councils, the need of some sort of expert control or direction by the state, the lack of true economy and business sense evinced by some such bodies. It is quite probable that in the case mentioned the board exercised what it considered to be its best judgment, and it is also quite possible that, as a result of some course of reasoning, it felt itself obliged to let the contract for public lighting to the lowest bidder, and that, having made no contract with any one, it could make the contract as stated without incurring any liability for damages to the gentlemen considered misled, and might even think themselves to be doing the village a great service. All these points would receive consideration in a trial of the case. It is very difficult to fix a liability of this sort upon a board, its right of judgment being so broad and the protection from liability for errors in judgment being so fully guaranteed by all the court decisions of the past.

There is a tendency in the case of larger cities to hold such corporations responsible for flagrant errors in action of their legislative bodies due to corrupt motives or to errors in judgment which could have been prevented by the slightest attention to evident facts or expert advice, offered or obtainable for the asking, but the officials of the smaller cities, towns and villages, are protected from such consequences, apparently on the principle that they are doing their best and should not be punished individually or as a corporation if honest errors are made. This doctrine is well established because there is a very large element of justice in it, since it can not be expected that the citizen who has been elected to represent his ward in the municipal legislature thereby becomes an expert in all lines of municipal government and improvement. We must look somewhere else for relief.

So far as the relief from the consequences of a wrong policy of government or of planning improvements is concerned, the only resort is to the voters of the municipality.

So far as the raising of money, the methods of expenditure and accounting, the terms of contracts, etc., are concerned, the resort at present is to the state legislature. The principal reason for the lack of business methods in caring for such matters, particularly in details, is the failure of the legislatures to perform their whole duty, the desire in many states to leave the government of the corporations in local hands causing the legislature to place as few restrictions upon local action as possible. Limitations of some sort were soon found to be necessary and they are made from time to time in the manner seeming for the moment to be most satisfactory. This lack of plan or of basis in principle is leading to a mixture of laws which is becoming all but unintelligible and which frequently produces quite as much injustice as it prevents. The legislature which will put the study of this question into the hands of an expert commission for the formulation of a full and logical plan for the guidance and

restriction of the municipal corporations of the state will take a long step in advance toward the solution of the financial and many administrative problems, of the smaller cities and villages, especially.

So far as errors in the technical steps of carrying out improvements, both legal and engineering, are concerned, there is at present no official resort for assistance. Experience in states where such advisory and administrative boards as state boards of health, state lighting commissions, state railroad commissions and the like have been established, indicates that the greatest promise of efficient aid in these technical lines lies in this direction. The state, in the exercise of its power to regulate its creations, the municipal corporations, has the right to create such boards and to give them the powers which are necessary to make their work efficacious. Too close regulation of municipal affairs by the state savors too much of paternalism to be satisfactory to citizens of the United States, but there is a happy medium of expert advice and restriction of vagaries of inexperience, ignorance or dishonesty which is entirely within the rights of the state to establish and will relieve the citizens of the dangers of inexperienced direction of technical matters without in the least restricting their liberty of action upon the policy under which the improvements shall be carried out.

THE QUESTION DEPARTMENT.

LOSSES IN HEATING AND GAS DISTRIBUTION SYSTEMS.

Can you refer me to any items, papers or reports showing percentage of loss to gas lighting and heating plants through their distributing systems by reason of defects, lack of care, etc.?

Frank H. Hamilton,
Chairman Street Committee,
Traverse City, Mich.

Experience with heating from central stations has not been sufficiently extended to give many data on losses in the distribution system. Mr. Alton D. Adams, in an article on "Heating from Central Stations" in the number of MUNICIPAL ENGINEERING for February, 1901, states that the actual rates of loss from distribution pipes may well range from 10 per cent. for a hot-water system extending a half mile from the station and well constructed, to 25 per cent. for a high pressure steam system extending the same distance. He assumes 20 per cent. as "a moderate figure."

In the fourteenth annual report of the commissioner of labor for 1899 is a report on his investigation of water, gas and electric light plants under private and municipal ownership. In Table VII, of Chapter III, is reported the loss by leakage in a large number of works. In 11 plants, producing less than 2,000,000 cubic feet a year, the leakage varies from 4.76 to 31.76 per cent., and averages 41.71 per cent. In 67 plants, producing from 2,000,000 to 5,000,000 cubic feet, the leakage varies from 0.16 to 37.42 per cent., and averages 11.89 per cent. In 59 plants, producing from 5,000,000 to 10,000,000 cubic feet, the leakage varies from 0.08 to 44.19 per cent., and averages 14.5 per cent. In 39 plants, producing from 10,000,000 to 15,000,000 cubic feet, the leakage varies from 2.61 to 36.07 per cent., and averages 14.5 per cent. In 46 plants, producing from 15,000,000 to 20,000,000 cubic feet, the leakage varies from 0.78 to 36.86 per cent., and averages 13.16 per cent. In 24 plants, producing from 20,000,000 to 25,000,000 cubic feet, the leakage varies from 4.75 to 25.81 per cent., and averages 12.62 per cent. In 37 plants producing from 25 to 50,000,000 cubic feet, the leakage varies from 3.36 to 38.98 per cent. and averages 14.15 per cent. In 16 plants producing from 50 to 75,000,000 cubic feet, the leakage varies from 3.21 to 27.65 per cent. and averages 12.85 per cent. In 9 plants producing from 75 to 100,000,000 cubic feet, the leakage varies from 3.52 to 34.36 per cent. and averages 14.08 per cent. In 17 plants producing from 100 to 500,000,000 cubic feet, the leakage varies from 4.82 to 14.90 per cent. and averages 9.37 per cent. In 8 plants producing more than 500,000,000 cubic feet, the leakage varies from 2.95 to 11.27 per cent. and averages 7.34 per cent. These averages are averages of percentages and not of actual losses, and are therefore slightly in error, but not enough to require a re-computation. It will be noted that for the larger outputs the percentage of loss is the smaller. This is probably due to two causes, the better care taken of the larger systems and the greater amount of gas passing through the pipes to actual use. The pressure remaining the same, the leakage would be practically the

same, whether no gas were used or gas were used to the full discharging capacity of the pipes for the given pressure, and the percentage of loss would therefore be very different.

POWER REQUIRED FOR SMALL ELECTRIC LIGHTING PLANT AND COST OF CONSTRUCTION AND OPERATION.

I wish to arrive at approximate cost of an electric light plant of sufficient size to supply ordinary requirements of a town of 1,000 inhabitants. What horse power would probably be required? The town would require about 6 arc lights and 300 incandescent lights. What would be the probable cost of such a plant and the expense of running?

Samuel Cole, DuShore, Pa.

The fourteenth annual report of the United States commissioner of labor gives a very large amount of information about water, gas and electric light plants in detail, but without reference to the name or location of the plants reported upon. The data in this report will give some idea of the cost of construction and operation of plants for such work as that described in the question, but the actual cost depends upon so many items of local conditions that no close estimate can be made.

On page 255 of MUNICIPAL ENGINEERING for October, 1900, will be found a number of collections and averages of data taken from this report by Mr. F. W. Cappelen, which will be of value and interest in this connection.

For this particular question some more detailed and individual information is desirable, and the following is given for plants of less than 75-horse power and under municipal ownership, approximating the conditions stated in the question:

A plant with 350 incandescent lamps is run with a 35-horse power engine and two boilers aggregating 100-horse power, the investment is $5,065, and the cost of production of light, not including an allowance for depreciation of plant, is $1,468 a year. It has 6 miles of wire weighing 994 pounds.

A plant with 50 arc lights is run with a 50-horse power engine, two boilers aggregating 140 horse power, cost $8,060, and is run for $2,341 a year. It has 14 miles of wire weighing 5,866 pounds.

A plant with 505 incandescent lights is run with a 60-horse power engine, 3 boilers aggregating 240 horse power, cost $8,150 and is run for $3,094 a year. It has 16 miles of wire weighing 1,667 pounds.

A plant with 2 arc lights and 573 incandescent lights is run with a 60-horse power engine, a 75-horse power boiler, cost $9,293, and is run for $2,244 a year. It has 9 miles of wire weighing 7,863 pounds.

There are 79 plants in the list using less than 75-horse power of engines, operating from 55 to 3,275 incandescent lights only, 13 to 100 arc lights only, or 15 arc and 83 incandescent to 35 arc and 1,102 incandescent lights in same system.

The series of articles on "Electric Light and Power Distribution," by D. W. Mead, the first of which appeared in August, will be of great value in the study of the question asked.

GARBAGE DISPOSAL AND APPARATUS THEREFOR.

Will you kindly furnish me with the names of manufacturers of garbage cremation machinery and apparatus, and with the name of any book or publication bearing upon this branch of sanitation?

Samuel H. Saleno,
Seattle, Wash.

In our advertising pages will be found the names of the City Wastes Disposal Company of 156 Fifth avenue, New York, who can give full information about methods of garbage destruction, and W. E. Garrigues, 1123 Broadway, New York, who is interested in garbage reduction processes.

There are no American books upon the snbject of garbage disposal. The volumes of MUNICIPAL ENGINEERING are the best sources of information upon the subject. Reference may be made to the following articles:

"Experiments in Chicago on Garbage Used as Fuel," page 38, July, 1901.

"Garbage as Fuel for Steam Production," page 140, March, 1901.

"Garbage Disposal in Lafayette, Ind.," page 329, June, 1901.

"Utilization of Refuse and Garbage for Fuel in England," page 170, March, 1901.

"An Outline of the System of Garbage Collection in the City of Toronto," page 392, December, 1900.

"Garbage Disposal," page 414, December, 1900.

"Garbage Disposal in Small Cities," pages 348, 410, November and December, 1900.

"How Properly to Collect and Dispose of Garbage" (called the best article on the subject that has appeared), page 331, November, 1900.

"An Efficient System of Garbage Collection and Disposal for a Small City," pages 160, 179, March, 1900.

"Disposition of Garbage at Cincinnati," page 333, December, 1899.

"Refuse and Garbage Disposal," page 99, August, 1899.

"Garbage Disposal," page 31, January, 1899.

"Garbage Disposal Systems" (gives a list of previous articles upon the subject), page 386, June, 1899.

SIZE OF HOUSE SEWER CONNECTIONS.

With reference to the size of house connections, can you refer me to some city where the 4-inch connection has been adopted?

C. W. S., Great Falls, Mont.

It would be easier to name the cities in which 4-inch connections are not used. A few taken at random from observation in the writer's practice, ranging from small separate systems to large combined systems, are Stamford, Schenectady, Tonawanda, Niagara Falls, New York; Frankfort, Indianapolis, Ind.; Bloomington, Ill.; Omaha, Neb. Since the advent of the separate system, there has been but little question of the adequacy of 4-inch house connections. Staley and Pierson in "The Separate System of Sewerage" ($3), and Folwell in his "Sewerage" ($3), definitely recommend this size. Robert Moore, of St. Louis, computed some years ago the sizes of lots which drains of various diameters would serve on various gradients, when there was a rainfall of two inches an hour. For the standard gradient of 4-inch pipe recommended, 2.5 per cent., that size of drain would serve a lot 50 by 150 feet, running three-fourths full. Reducing the gradient to one per cent. reduces the size of lot that can be served to 60 per cent. This justifies Mr. Folwell's statement that the 4-inch house connection is large enough for any residence or small hotel, or in general for 90 per cent. of all the buildings in most cities.

BOND FOR ELECTRIC RAILROADS.

Who manufactures the Edison-Brown bond for electric railroads spoken of by Mr. E. E. Brownell, in his article entitled "Some Facts and Figures Regarding Electrolysis" in MUNICIPAL ENGINEERING for August, 1900?

L. M. Dalgarn, Natchez, Miss.

The Edison-Brown bond is manufactured by the inventor, Harold P. Brown, 120 Liberty street, New York City.

INFORMATION ABOUT WORKING ASPHALT.

What has been published on working asphalt floors and roofs? I want to make a floor smooth and in workmanlike shape.

A. Millen, Battle Creek Mich.

Little has been published on the working of asphalt aside from the specifications for pavements and sidewalks issued by city officials and by asphalt paving companies. The latter will supply on application their circulars and booklets, giving much valuable information on asphalt and methods of working it. Addresses can be found in our advertising columns.

Some books which may be of assistance are Delano's "Twenty Years of Practical Experience of Natural Asphalt and Mineral Bitumen" (50 cents); "Howard's "Natural Asphalt and Its Compounds" (75 cents); Malo's "L'Asphalte" (French); Greene's "Natural Uses of Asphalt" and "Asphalt and its Uses."

Aside from the many articles in MUNICIPAL ENGINEERING on asphalt paving, the following articles on other uses of asphalt will be found valuable:

"Injurious Manipulation of Asphalt," page 169, April, 1895.

"How to Do Vertical Work in Asphalt Surfacing," J. W. Howard, page 351, May, 1896.

"Preparation of Asphaltic Cement in Binder Course of Pavement," J. W. Howard, page 354, May, 1896.

"Asphalt Lining for Water-Works Reservoirs," L. J. LeConte, page 8, July, 1896. Editorial comment, page 318, November, 1896.

"Coal Tar with Asphalt," page 90, February, 1897.

"Fluxes or Tempering Materials for Asphaltum," J. W. Howard, page 231, April, 1897.

"Agitation of Asphalt Cement by Air or Mechanical Stirring," J. W. Howard, page 34, January, 1898.

"Asphaltum Paint Ingredients," J. W. Howard, page 89, February, 1898.

"Specifications for Asphalt Mastic Floor," page 47, July, 1899.

"Sand for Asphalt or Other Sidewalk Mixtures," page 152, September, 1899.

"Asphalt and Coal Tar Paints," page 348, June, 1901.

CREOSOTED WOODEN BLOCK PAVEMENTS.

What is the tenor of opinion as to the use of creosoted wooden block pavements in Indianapolis and elsewhere?

C. C. Oakey, Managing Editor, The Terre Haute Express.

The opinion in Indianapolis among property owners seems to be distinctly favorable to the use of creosoted wooden block pavements. The oldest pavements laid with properly creosoted yellow pine blocks have now been in use for about four years and are still in excellent condition. But one of these streets has anything approaching heavy traffic, and this one has also a double track street railway, thus concentrating the wheel wear. Concrete foundations are used and the expansion of the blocks from moisture is very closely watched and remedied when necessary.

This favorable opinion seems to be based on the success of the blocks in sustaining the wear of the rather light traffic to which they have been subjected, the pleasanter color of the surface and the comparative absence of noise. The wooden streets are very slippery at times, almost enough to

require sanding, and ordinarily cost somewhat more than asphalt, say 20 to 30 cents a yard (10 to 15 per cent.). The amount of this difference in cost depends upon local conditions. An important item in such pavements as those described is the character of the creosote used in treating the blocks. Some of the oil offered under the name is quite seriously adulterated with materials which do not take the place of creosote as a wood preservative and should be carefully excluded by the terms of the specifications.

Indianapolis is almost alone in this country in the use of this material for street pavements. Toledo has admitted it to competition this year. England and other European countries use large quantities of wood in pavements, both treated and untreated. The Indianapolis pavements have probably been successful because they have been laid with good foundations, of good material and in a very careful manner, similar to the European practice. Very few other wooden pavements in this country have been laid in respect to all three of these conditions with anything like the same excellence.

STREET SWEEPER ON MACADAM STREET.

Is it practicable to use a steel sweeper on a macadam road when a steam roller is in use?

F. J. Griffith, City Sec'y-Treas., Sherbrooke, P. Q.

On macadam streets made specially hard and kept always in the best condition and on which the steam roller is used freely, street sweepers have been used to some extent. A surface made of hard material, thoroughly bound together with suitable material, is necessary for the most satisfactory results. The softest brush which will move the fine material to be swept off should be used. A stiff steel brush would probably not be altogether satisfactory. Will any of our readers tell what materials for brushes have been most satisfactory in their own experience in sweeping macadam streets, roads or boulevards?

DUTIES OF OIL INSPECTOR.

Can you tell me what are the methods of work of city oil inspectors which are in vogue, or direct me where I can obtain the desired information? The city ordinance directs that he shall test kerosene, gasoline, etc.

E. J. Noonan, City Engineer, La Salle, Ill.

The Illinois statute provides for the tests of oils which are to be made, naming J. Tagliabue's pyrometer as the standard apparatus and 150 degrees Fahrenheit as the standard temperature. If oils tested in the pyrometer or "some other instrument or means equally accurate" will not ignite or explode at this temperature, the package is marked approved and the fire test is stated. If it does ignite at a less temperature, the package is marked as condemned for illuminating purposes and the fire test is stated. Full records must be kept. The amount of fee is regulated by city ordinance.

The Indiana statute provides for a state inspector and deputies who are paid by fees. The apparatus is a dish in water to which the heat of an alcohol lamp is applied. The oil is thus heated without contact of its holder with flame. The oil is tested for every five degrees increase in temperature from 100 degrees F. by applying the fresh flame of a clear burning wood taper without sulphur or other chemical. If the oil flashes below 120 degrees it is condemned for illuminating purposes. The flash point is marked on every inspected package.

COST OF SEWER SYSTEM FOR CITY OF 100,000 POPULATION.

Will you give us approximate cost of sewerage systems in representative American cities of the size of Syracuse (108,000) and statement whether the systems are good and complete or not?

W. P. Baker, Syracuse, N. Y.

The information in the following table is taken from the volume of "Social Statistics of Cities," of the eleventh census of the United States, for 1890:

COST OF SEWER SYSTEMS IN CERTAIN CITIES, 1890.

City.	Population in 1890.	Miles of sewers.	Population per mile of sewer.	Cost of sewer system.	Cost per capita.
Allegheny, Pa.	105,287	38	2,771	$1,063,142	$10 10
Denver, Colo.	106,713	61	1,749	574,848	5 39
Jersey City, N. J.	163,003	57	2,860	.....	.....
Kansas City, Mo.	132,716	114	1,164	1,844,165	13 90
Louisville, Ky.	161,129	52	3,352	10,000	0 75
Minneapolis, Minn.	164,738	60	2,746	2,446,552	14 85
Newark, N. J.	181,830	87	2,090	.....	.....
Omaha, Neb.	140,452	73	1,924	1,217,173	8 67
Providence, R. I.	132,146	64	2,065	2,135,489	16 16
Rochester, N. Y.	133,896	138	970	873,220	6 52
St. Paul, Minn.	133,156	103	1,293	2,085,700	15 66
Scranton, Pa.	75,215	25	3,009	296,913	3 93

From this table is derived an average of the population per mile of sewer of 1,869 for the 1,630,281 population and 872 miles of sewer in the cities reported.

The average cost of sewers per capita is $11.15 for the 1,124,319 population, and $12,536,152 total cost in the cities reporting this item. Louisville is omitted from this average, as the report of cost is evidently defective.

The following table contains the information on the same points for 1899 or 1900, which is at hand:

COST OF SEWER SYSTEMS IN CERTAIN CITIES, 1900.

City.	Population in 1900.	Miles of sewers.	Population per mile of sewer.	Cost of sewer system.	Cost per capita.
Columbus, Ohio	125,560	146	860	$2,429,040	$19 34
Indianapolis, Ind.	169,164	83	2,038	1,467,632	8 67
Minneapolis, Minn.	202,718	150	1,351	.....	.....
Providence, R. I.	175,597	156	1,125	.....	.....
Rochester, N. Y.	162,608	223	729	1,962,728	12 06
St. Paul, Minn.	163,065	168	971	2,994,821	18 36
Scranton, Pa.	102,026	58	1,760	.....	.....

From this table is derived an average of the population per mile of sewer of 1,118 for the 1,100,738 population and 984 miles of sewer in the cities reported.

The average cost of sewers per capita is $14.24 for the 620,397 population and $8,834,221 total cost in the cities reporting this item.

None of these cities, except Providence, has a sewage purification plant, and this was not established in 1890, so that it does not enter into the consideration, the cost of the Providence sewers to 1900 not being reported. Several cities have expensive intercepting sewers, notably Columbus, Indianapolis, Providence and Rochester, which have all been constructed since 1890.

Two tendencies are very strongly marked in the tables. One is the decrease in the population per mile of sewer, indicating that the population was more thoroughly served in 1900 than it was in 1890. For cities in both tables we find

City.	Population per mile of sewer. 1900	1890
Minneapolis	2,746	1,351
Providence	2,065	1,125
Rochester	970	729
St. Paul	1,293	971
Scranton	3,009	1,760
Averages of tables	1,869	1,118

The cost of sewers per capita has increased as follows:

City.	Cost of sewers per capita. 1890	1900
Rochester, N. Y.	6.52	12.06
St. Paul, Minn.	15.66	18.36
Averages of tables	11.15	14.24

The city of Rochester has considerable influence in increasing the cost per capita. This seems to be because the population was better served in 1890 than any other city in the list, the population per mile of sewer being only half the average, and the expensive intercepting sewers have been built since 1890, thus increasing the average price per foot much more rapidly than the length of sewer was increased. The same seems to be true, to some extent, of St. Paul. It is probable that the actual average cost per mile of service sewers is materially less than in 1890 for several reasons, including lower prices for materials, and smaller sizes necessary for branches. Many branches are built in thinly-settled portions of some cities to aid in their development, increasing the average cost per capita because the average number of persons served per foot of sewer is decreased. Also the cost of intercepters and outlets is greater than would be necessary for present needs, thus causing a present excess in the cost of sewers per capita, which will be reduced in future reports.

These considerations are suggested as an explanation of the fact that the average population served per mile of sewer is shown by the tables to have decreased 40 per cent., while the cost of sewers per capita has increased 28 per cent.

Those cities which have the average population per mile of sewer or a less number are known to be well covered. Indianapolis had very few sewers in 1890 and was not reported in that year. The city of that date is well covered by the sewer system constructed in 1890–1900, but new areas taken in within two or three years are not yet sewered, thus increasing the population per mile of sewer until the new areas can be supplied.

The density of the population is indicated

by the following figures from the census of 1890.

City.	Area acres.	Population per acre.	Miles of streets.
Allegheny, Pa.	5,096	20.66	138
Columbus, Ohio	8,975	9.82	....
Denver, Col.	10,576	10.09	756
Indianapolis, Ind.	6,965	15.14	400
Jersey City, N. J.	8,320	19.59	165
Kansas City, Mo.	20,774	6.39	383
Louisville, Ky.	7,913	20.36	314
Minneapolis, Minn.	33,079	4.98	1,025
Newark, N. J.	11,375	15.99	186
Omaha, Neb.	15,680	8.96	508
Providence, R. I.	9,277	14.24	168
Rochester, N. Y.	9,993	13.40	255
St. Paul, Minn.	32,908	4.05	970
Scranton, Pa.	8,628	8.72	125

The last column gives the mileage of streets and alleys. A few cities report separately. Denver having 481 miles of street proper; Indianapolis, 288; Kansas City, 267; Louisville, 205; Minneapolis, 800; Rochester, 240; St. Paul, 741. Newark has no alleys.

A study of this table in connection with that of mileage and cost of sewers will show the relative extension of sewer systems over the city areas.

In forming an idea in this general way of the probable cost of a system of sewers, the matter of sewage purification must not be neglected. The intercepting sewers and purification plant considered necessary for Columbus, Ohio, are estimated to cost $2,250,000.

ASPHALT PAVEMENTS FOR SOUTHERN CITIES.

Is asphalt suitable for streets in a climate like that of Nashville? What southern cities have asphalt streets? Which is the cheapest in the long run, asphalt or broken, dusty limestone?

Wm. J. Ewing, Editor,
The Nashville (Tenn.) American.

Theoretically, asphalt pavements should be somewhat more satisfactory in the southern states, since the mixture can be made hard enough to stand the temperatures there experienced, and the temperatures of winter are so much higher and of so much shorter duration than in the north. Practically, a contractor must learn the consistency of mixture most suitable to the climate, and if inexperienced in southern work may fail to lay the best possible pavement on his first contracts. Enough pavement has been laid in the south to provide the necessary experience so that this experimentation is no longer necessary.

Asphalt has been laid in the following southern cities: Atlanta, Augusta and Savannah, Ga., Baltimore, Md., Charleston, S. C., Chattanooga, Tenn., Covington, Louisville and Newport, Ky., Houston and San Antonio, Tex., Kansas City, St. Joseph and St. Louis, Mo., Los Angeles, Cal., New Orleans, La., Norfolk and Richmond, Va., Asheville, N. C., Washington, D. C.

The question of the relative cost of asphalt and macadam for a term of years can not be answered definitely. The first cost of a macadam street depends upon the kind of street which is constructed and the cost of the materials used. It varies from 45 cents to $1.75 in American cities, Nashville being one of those reported for the lowest price. The cost of maintenance varies according to the kind of materials used, the method of laying and the amount of traffic. It varies from 1 cent to 60 cents or more a square yard per year, so that the cost for a series of years can be estimated with close approximation, only with full knowledge of what is defined as macadam pavement and what is the traffic to which it is subjected, as well as what is understood by the terms "repair" and "good condition."

As a single illustration for special conditions, it may be said that a boulevard of the best construction with crushed granite wearing surface was constructed in Indianapolis, under a five-year guaranty that it would be kept in condition, for a price about 10 per cent. less than asphalt streets cost in the same city under the same guaranty.

The granite wearing surface had very nearly disappeared at the end of the five years, but the surface of the street was in good condition. This was the contractor's estimate of the cost of constructing and keeping up the road for five years. Whether he made or lost money is not reported. The surface rapidly deteriorated after the expiration of the guaranty period, and there is no authentic information regarding the later cost of keeping the street in ordinary condition. The cost of keeping asphalt streets in repair also varies according to local conditions and methods of keeping up streets. Reports from Buffalo indicate that the cost of repairs the first year after guaranty has expired is less than 1 cent a yard, for the first five years after guaranty has expired it averages 3 cents a yard a year and for the second five years 15 cents a yard a year. Cincinnati reports 7½ cents and 14 cents, respectively.

The question of the relative expense of maintaining macadam and asphalt or other so-called permanent pavements is, after all, not the most important one arising. A well-kept hard surface pavement has many advantages for city use which can not be measured in money, as well as some the effect of which in saving money are evident but which it is difficult to reduce to exact figures. Among these may be mentioned

the practical removal of the dust and mud nuisances (of direct money value); the great improvement in the appearance of the street; the effect upon property holders in inducing improvements in lawns, yards and even buildings; the better appearance of vehicles, and reduction in wear and tear upon them, and in labor to keep them in condition; the improvement in drainage with a reduction in deposits of street dirt in sewers. All these and many other advantages of smooth pavements, well kept, are worth money or save money, and a considerable increase in cost of construction and maintenance could be justified by them if it were necessary.

COST OF ARC LIGHTING PLANT.

What would be the approximate cost of an arc-lighting system for a city of 10,000, requiring, say 100 lights and about seven miles of line, with proper allowance for an increase in population of 200 to 300 a year? What is the comparative cost per year of arc lights furnished by the city and furnished on contract by a company? *Subscriber*, ——, *Pa.*

Reference is made to the answer in this number entitled, "Power Required for Small Electric Lighting Plant and Cost of Construction and Operation;" also to the article on page 255, of the number for October, 1900. The following additional data are given, taken from the report of the commissioner of labor, which is also the basis for the answer referred to:

Municipal plants of about 100 lights capacity, constructed for arc lighting alone, are estimated to cost as shown in the following table, the names of plants being withheld:

COST OF MUNICIPAL ARC LIGHTING PLANTS.

No. of lights.	Miles of line.	Cost of plant.
100	31	$16,282
100	18	12,500
101	15	20,000
136	14.75	16,055
106	17	14,500
115	10	28,569
113	21	13,000
104	18	18,000
120	30	23,525
156	34	36,500
146	42	25,414
161	37	34,419

The cost of light in these twelve cities, including proper allowances for depreciation and taxes, has been computed for the report and varies from $43.87 per lamp per year for lamps using 441 watts per hour for 2,156 hours a year, to $86.68 for lamps using 500 watts an hour for 4,000 hours a year.

In cities for which light is furnished by private companies, using from 100 to 160 lamps each, the contract price varies from $36 per lamp per year for lamps using 450 watts per hour for 1,200 hours a year to $138 for lamps using 476 watts for 3,988 hours a year, with one exceptional price of $173.03 for 350-watt lamps 3,855 hours per year. Without reference to number of hours of use, the price per lamp per year in these cities is distributed as follows:

1 pays less than $40.
2 pay between $50 and $60.
6 pay between $60 and $70.
10 pay between $70 and $80.
12 pay between $80 and $90.
12 pay between $90 and $100.
3 pay between $100 and $110.
3 pay between $110 and $120.
1 pays between $120 and $130.
2 pay between $130 and $140.
1 pays between $160 and $170.

In 17 cities owning plants for arc lighting only, the cost per lamp per year on the basis stated above varies as follows:

In 1 cost is less than $40.
3 " from $40 to $50.
8 " " 50 " 60.
2 " " 60 " 70.
3 " " 80 " 90.

If the method of reduction to a common basis, used in a few places in the report, is adopted, the difference in consumption of electricity per lamp is ignored, and the cost is assumed to be proportional to the number of hours a year the lamp is used. While this is not accurate, the result may be of interest. The 17 city plants noted above, if reduced in this manner to a uniform operation for 4,000 hours a year, would give cost from $47.78 to $110.40 per lamp per year, averaging $71.16. The 53 private plants, reduced to the same basis, would charge from $63.40 to $218.60, averaging $115.81 per lamp per year. Approximately the same relative difference between cost in municipal and private plants is shown in a table on page 257 of MUNICIPAL ENGINEERING for October, 1900, which gives the average cost in each class of plants for lamps in use the same number of hours a year, being collected in this form from the labor commissioner's report. Thus: the cost per lamp per year in plants where lamps are burned 2,000 to 2,250 hours a year is $81.51 for private and $39.73 for municipal plants, and for plants where lamps are burned 3,750 to 4,000 hours a year is $101.97 for private and $58.56 for municipal plants. These figures are probably slightly too small for municipal plants in comparison with private plant charges, for in a few cases the cost of municipal lighting is reported as nothing or

very small, because the profits from private lights furnished are sufficient to pay the cost of running the municipal lights.

Some cities of about the number of lights mentioned, which are supplied by contract with a private company, are Amsterdam, N. Y., Charleston, S. C., Circleville, O., Dover, N. H., Gloversville, N. Y., Janesville, Wis., Kingston, N. Y., Madison, Wis., New London, Conn., Allentown, Pa., Butte, Mont., Belleville, Ill., Columbus, Ga., Des Moines, Ia., East St. Louis, Mo., Ft. Smith, Ark., Iowa City, Ia., Kenosha, Wis., Keokuk, Ia., Massillon, O., Natchez, Miss., Oil City, Pa., Owensboro, Ky., Parkersburg, W. Va., Roanoke, Va., Rutland, Vt., San Antonio, Tex.

Among municipal plants of similar size may be mentioned Batavia, N. Y., Decatur, Ill., Easton, Pa., Goshen, Ind., Marion, Ind., Meadville, Pa., Paducah, Ky., Titusville, Pa.

EARTHWORK—A DAY'S WORK AND ITS COST.

We are desirous of obtaining statistics on comparative cost of day labor on ditching or earth handling in various localities of the country, taking into consideration the different classes of labor employed and also the maximum amount of work in cubic yards that constitutes a day's work in shoveling for one man in various localities.

F. C. Austin Mfg. Co., Harvey, Ill.

Several books give general estimates and statements of the amount of work done by a man shoveling and its cost.

Byrne says in his "Inspector's Pocket Book" (83) the average quantity of loose earth or sand shoveled by a man into a cart is 2 cubic yards an hour, of clay and heavy soils, 1.7 cubic yards, and of rock, 1 cubic yard. This does not include loosening the earth. One man with pick can loosen 1 cubic yard an hour of clay or cemented gravel, 2 to 3 cubic yards of loam and loose gravel, 4 to 6 cubic yards of light sand.

Trautwine bases the statements in his "Engineers' Pocket Book" ($5) on investigations by Ellwood Morris and on common labor at $1 a day of ten hours. In fairly regulated gangs men work 0.6 the time and are waiting for cart, etc., 0.4. He says there is mismanagement if each man shovels less than 24 yards of light sandy soil, or 17.2 yards of heavy soils in ten hours. He bases this on the results of observation, that a man can load a cart with a capacity of one-third of a cubic yard with sandy soil in 5 minutes, with loam in 6 minutes, with heavy soils in 7 minutes. Allowing 10 hours for a day and 0.4 lost time gives the results stated. The man with the pick can loosen 14 yards a day of stiff pure clay or cemented gravel, 25 yards of strong heavy soils, 40 yards of common loam or 60 yards of light sandy soils. These figures are all somewhat larger than Byrne's. Both are eastern men whose experience has been largely in the eastern states.

Rankine (English) gives 20 cubic yards of loose sand or mold or 16 cubic yards of clay or compact earth per day, per shoveler.

Mr. G. A. Parker has recently reported his method of managing a gang with its attendant wagons so that each shoveler has 15 to 30 seconds in which to throw 5 shovelfuls of dirt, resting the remainder of 50 seconds. In a day he is said to handle 22 4-5 yards with less exhaustion than he handles 12 under the common method. The principal improvement is in the manner of handling teams.

Observation in Omaha indicates that one shoveler can throw 11 cubic yards of earth out of a sewer trench in a day. The soil may be classed as nearly as easy to handle after loosening as loose earth or sand, but will stand without sheeting for almost any depth of trench. The cost of labor is given as $1.50 a day.

Mr. C. D. Barstow gives figures for water pipe laying in trench averaging 3.5 feet depth, in a southern city, in 1892, from which it is computed that, including both picking and shoveling from the trench, one man handled 4.8 cubic yards a day of hard cemented clay and gravel, or equally hard traveled street surface. If we assume that as many men were required in picking as in shoveling, each shoveler handled nearly 10 cubic yards a day. On another trench the figures are 6.2 and 12.4 respectively. In bottom land, where less picking was necessary, each man, including picking and shoveling, handled 11.8 cubic yards a day. In filling and tamping trenches, one man, including tamping and shoveling, handled 7.4 cubic yards a day. Two men placed and tamped earth around the pipe, four men shoveled in and four men tamped the trench, the last six inches being filled in without tamping. It is probable, therefore, that one man shoveled an equivalent of about 15 cubic yards a day. Colored labor was largely employed at $1.25 a day, a few being paid $1.50. Less work was expected of men than in the north.

Some records of pipe laying in Providence, R. I., of 1890, and previous years, show work done by one man in excavating water-pipe trench, laying pipe, and refilling trench. The proportion to be deducted for laying pipe is not easy to determine, but when made approximately indicates that from 10 to 12 cubic yards of sand were handled

twice by one man in a day, slightly less of sand and gravel and about 7 cubic yards of hard or moist clay. The second handling of the latter would probably be easier than the first, also filling trench would be easier than excavating, so that these figures should not be multiplied by two to obtain the amount of earth in excavation handled. The work in the southern city mentioned gives some indication of the difference in labor required in excavating and in refilling.

Pay of laborers varies with place and time. The figures given above give some indication for various times and sections of the country. Some other figures may be given. A southern engineer gives $1.50 for a nine-hour day in the north and 75 cents for a ten to twelve-hour day in the south. Ithaca, N. Y., paid $1.35 in 1896. Staley & Pierson's tables of cost of sewer work quote laborer's wages in the east at $1.50 a day. Tillson quotes $1.25 for laborers on street construction in Brooklyn. The United States department of labor and the various state departments of labor and of statistics give comparatively fresh reports upon the wages of labor from year to year.

INFORMATION ABOUT MACADAM FOR STREETS.

Would you kindly inform me of the different materials used in making a macadamized street, the depth of each material used, the best way to construct such a street and the approximate cost per square yard of such street. *M. F. Partridge, Councilman, Portland, Ind.*

The back numbers of MUNICIPAL ENGINEERING have many articles upon this subject. With reference to materials and methods of construction, reference may be made to the following articles:

"Requirements for Telford-Macadam Pavements in Quincy, Ill.," page 405, June, 1896.

"Macadam vs. Telford Roads," page 374, December, 1897.

"Highway Improvement Discussed by Experts," page 249, April, 1897.

"Rules for Maintenance of Macadam Pavements," page 181, September, 1898.

"Tests of Stone for Road Making," page 253, October, 1898.

"Discussion on Road Building by Am. Soc. C. E.," page 259, October, 1898, and page 80, August, 1899.

"How to Construct a Macadam Road for Heavy Traffic," page 168, March, 1900.

"How Fine Macadam Stone Should be Crushed," page 35, January, 1900.

"Importance of Drainage in Making Good Roads," page 216, October, 1899.

"Road Making in Massachusetts," pages 330, 332, 333, May, 1900.

"Scientific Road Construction in Massachusetts," page 256, April, 1899.

"Use of Sandstone in Telford," page 85, July, 1900.

Various articles on "Tar Macadam" and "Bituminous Macadam," on pages 283, October, 1900; 362, November, 1900; 423, December, 1900; 84, February, 1901; 204, April, 1901; 262, 296, May, 1901; 322, 370, June, 1901; 78, August, 1901.

"Standard for Rejection of Macadam Stone," page 22, July, 1901.

"Bituminous Pavement Specification," page 40, July, 1901.

Other information will be found in this number.

With reference to cost, there are many references for all classes of pavement. From page 126, February, 1896, is obtained the cost of a Telford road in the Back Bay district of Boston, a mile costing $55,068, including subgrading, telford, macadam, granite block gutter, edge stone, brick sidewalk, flagging. The telford and macadam alone, 19,360 square yards, cost $1.16 a square yard in place. On pages 154, September, and 310, November, 1896, are estimates of cheaper constructions, up to $7,500 a mile, 9 feet wide and 8 inches deep. See, also, page 33, July, and 145, September, 1897. On page 222, April, 1898, will be found a detailed statement of the average cost of a mile of macadam highway in Massachusetts. On page 150, March, 1901, details of cost of macadam materials and construction in a small city. An article on page 12, July, 1901, on "Road Improvement in New Jersey," gives prices for various grades of road building.

Lists of books upon all kinds of road building and street pavements will be found on page 231, April, 1897; page 373, December, 1898.

Close approximations to the local conditions in Portland can be found in some of these articles and books.

COST OF MACADAM AND CURB.

(1). What will good macadam cost approximately per square yard when finished, 10 inches deep in center and 8 inches on sides, including all rolling and excavating of street to a depth of 1 foot, 30-foot wide driveway? (2). What will be the cost per lineal foot of good stone curbing including all necessary material and work in setting.

L. H., Subscriber, ——, Wis.

There are so many variables entering into the cost of both macadam and curb that definite information about the cost at any particular place can not be given without knowledge of the specifications, the character of material available, freight rates, methods of payment for work, etc. Our department of Improvement and Contracting News from month to month gives the prices at

which such work is let. Reference to reports of recent contracts show the prices which prevail under the respective local conditions as to specification, material, freight-haul, etc. Some of these are as follows:

New Jersey 8-inch macadam, Camden, 79 to 88 cents a square yard; Woodbury, 73 cents to $1.09 a square yard. This is exclusive of excavation, which costs 20 to 25 cents, and underdrains which cost 8 to 20 cents. More detailed figures of cost are given in an article on "Road Improvement in New Jersey" in MUNICIPAL ENGINEERING for July, 1901. In Chicago, macadam costs about 88 cents a square yard; in New York City from 75 cents to $1.05, and Telford pavement from 70 cents to $1.10.

In New York City curb costs $1.05 a lineal foot; in Meadville, Pa., 5x22 inch, 49 to 53 cents, and 5x18 inch, 30 to 43 cents; in Toledo, Ohio, Medina, 50 to 65, and Berea 33 to 40; in Marion, Ind., Berea, 45 to 55, and limestone, 29 to 35; in Baltimore, Md., 6-inch, 98 cents to $1, and 5-inch, 75 to 83 cents; in Iowa, 33 to 46 cents; in Topeka, Kan., 45 to 57 cents; in Michigan, 52 to 58 cents.

PATENTS ON CEMENT WALKS.

Have the patents expired on cement walks or pavements? *A. P. Wingate, Wellsboro, Pa.*

There are no patents on the ordinary cement walks made with cinders, gravel or broken stone, sand and cement. Some combinations of special materials have been patented and are laid under such names as granolithic, slagolithic, etc., though some walks bearing these names are made of ordinary materials, the use of which can not be controlled by patents.

CEMENT WALKS OVER AREA WAYS.

I want some information as to practical and cheap ways of building cement walks over areas and such places, using old rails or small I-beams. *W. W. Cooley, Clinton, Iowa.*

For the small construction suggested the usual four-inch cement walk has sufficient strength, so far as the concrete portion is concerned, provided the concrete is made somewhat richer in cement; say, 1 part Portland cement, 2 or 2½ parts sand, and 4 to 5 parts of aggregate. It will be best to give a slight arch to the span, making the concrete 4 inches thick at the center of the arch and increasing its thickness toward the supports to keep the top surface horizontal. The important question is the distance apart to place the beams used to support the arches. This depends upon the size of beams, the width of opening they must span and the weight of sidewalk, and maximum load assumed to be on it. For I-beams and similar shapes, the pocket books of the iron manufacturers give for each size and for various spans the weight which the beam can safely carry. This weight is, most of it, distributed over the whole area of the walk and so the area of walk which a beam can carry is determined, and thence the distance between beams. This computation should be made or revised by an engineer familiar with the methods and in possession of all the facts necessary for the particular case.

In construction forms must support the arches until they have set, and the scaffolding must be strong enough to hold the weight of the concrete until it will carry itself. The end beams of the series must be solidly set so that there will be no spreading or excessive vibration. If this can not be done, tie rods run through the beams from end to end of the walk, or between adjacent beams, can be used to take the thrust of the arches. These rods should be embedded in the concrete as nearly as possible. Iron plates, plain or corrugated, bent in arch form are often used for the under surface of the arches, serving also as forms for supporting the concrete during construction.

REPAIR OF CEMENT WALK.

How can a cement walk be repaired that is spreading at its joints? *H. A. Rowland, City Engineer, McPherson, Kan.*

The reason for the spreading should be stated in order to give data for determining the method of preventing it. The joints may spread because the foundation settles or is washed out, causing portions of the walk to settle, thus opening the nearest joints. In this case the foundation should be repaired or replaced. The blocks, if well made, can be taken up and replaced, but great care must be taken to give them good, uniform bearing, and to prevent any possibility of cross breaking strains.

The longitudinal joint may open because the heat expands the blocks and they afterwards contract toward the center or some fixed point in the block. Dirt, filling the joint, causes the same operation later to increase the opening. Calking the joint will prevent further opening.

The transverse joints may open because the expansion by heat is great enough to cause the blocks to rise at such joint as offers the least resistance. In some cases the force is so great that the walk crushes, perhaps with an explosion, in others the

blocks rise into a roof-shaped form. In such cases the base of the walk is probably not well laid, does not have sufficiently uniform bottom surface, and the lower parts of the abutting faces of two adjoining blocks are too easily crushed off. If this occurs at several places the amount of rise at any one place is small, but it may be necessary to take up the blocks and relay them. If it is all concentrated at one place this might require that one of the rising blocks be trimmed off or a new one be laid in its place. The fact that the walk was not perfectly laid in the first place is against a long life of the relaid blocks, for slight cross-breaking strains or shocks will cause the top surface to crack and disintegrate.

COST OF CITY SURVEYS.

Please give me as close an approximation as you can to the cost of surveying a town containing 57 squares, placing and burying monuments, and witnesses to the same, furnishing a map and also a book of maps of the squares on a large scale which will enable a competent engineer to secure a starting point and direction at any street crossing for any work that may be required of him. Additions to the city may increase the work somewhat. What articles have appeared in MUNICIPAL ENGINEERING upon this subject?

F. A. Polsley, Port Gibson, Miss.

There is so much difference in the amount of work required in different cities that it is not always possible to make just comparisons. There are at hand, however, reports of the work done and the cost of surveying several cities, which are sufficiently detailed to make fairly safe bases for comparison with similar work.

The city of St. Louis, Mo., outside the limits as they existed in 1870, covering about 28,000 acres, was surveyed by the sewer department with sufficient independence of other work to make a statement of cost possible. The city was first triangulated; a series of lines of precise levels was run, aggregating 240 miles in length; a topographical survey, with transit and stadia, was then made, locating a very few buildings, such street corners as could be readily found, and fences marking street lines. A complete survey of the streets was not attempted. The triangulation took 94 days, the leveling 250 days, the topography 471 days and the office work 281 days. The total cost of the survey, including instruments, office furniture, horse, wagon and keep, repairs, stationery, etc. (amounting to about $3,500), was $35,473.33. If the office work is divided among the other three divisions in proportion to the number of days of field work in each, the total cost of field and office work for triangulation is $4,079.43, or $0.145 an acre; for precise levels is $10,890.31, or $0.277 an acre, and for topography $20,503.59, or $0.732 an acre. The total cost per acre is $1.154. A detailed description will be found in an article by B. H. Colby in the Journal of the Association of Engineering Societies, in January, 1893.

About the same time the city of Roanoke, Va., made a survey, including much more work. According to the ordinance fixing the program for the survey, the regular force consisted of two parties of four men each, three office men, including the engineer in charge, and such additional unskilled aid as might be necessary. Three base lines were measured, the area was triangulated, a meridian established, and the boundary lines were surveyed. A skeleton survey was then made locating points at intersections of streets and elsewhere. Upon this was based a detailed survey locating all corners, buildings, street lines and fence lines. When true street and alley lines were located they were monumented, and reference points located. Levels were run for profiles of streets and bench-marks were located. A map of the adjusted and corrected survey was made on a scale of 100 feet to the inch, and detail maps on a scale of 20 feet. A smaller map for publication, on a scale of 450 feet, was also provided for. The field work of the triangulation cost $579.48, the office work $386, materials $172.52, a total of $1,138, which for the 6,000 acres covered, made the triangulation cost less than 20 cents an acre. The survey was stopped when $20,500 had been expended, but it was estimated that $3,000 would complete it. The area covered by the surveys (except the triangulation) was 3,500 acres, so that the completed survey would have cost practically $7 an acre.

A few years earlier a survey of the city of Lowell, Mass., was made for a set of assessors' maps. A base line was measured, a series of triangles located and angles read and each lot was surveyed, including buildings. Over 500 traverses were run from over 1,200 angle stations. Descriptions in deeds were plotted, and the plans, deeds and surveys were harmonized. The scale of maps is 50 feet to the inch. Tracings were taken for the assessors. The work at the time report was made had been in progress seven years without interruption. For four years two parties of three each were on the survey, and for three years one party was employed. About 3,577 acres of the most valuable and thickly settled portions had been finished at an average cost of $9 an acre. The remainder of the survey proba-

bly cost less, as the lots are larger and there are fewer buildings.

Nashua, N. H., surveyed 4,600 acres at a cost of $6,400. This survey included two base lines and triangulation, costing $200, traverse lines around districts of 200 to 250 acres, and location of property divisions, and buildings in the business district only. Maps were made on a scale of 40 feet to the inch, deeds were examined and areas of all lots computed.

Articles on city surveys and maps, their uses and their value, will be found in MUNICIPAL ENGINEERING on pages 94, August, 1899; 304, May, 1897; 236, May, 1895; 181, April, 1895.

OUTFIT FOR A CITY ENGINEER'S WAGON.

Mr. L. W. Mathewson, engineer of the village of Wyoming, O., sends the following description of the complete outfit to be provided for in a city engineer's wagon and his method of fitting up the wagon to carry it conveniently:

For a complete outfit, the following articles are necessary. A transit and level with their boxes, two tripods, three steel shod flag poles, one target rod, a full set of surveyor's pins, two steel tapes, and one metallic tape, four plumb-bobs, one ax, one straight-blade hand ax, one pick, one spade, one 7-pound double-head sledge and stakes from three feet long and three inches square on the head down to nine inches long and one inch square on the head. Unless a wagon is specially fitted up, all these make a hodge-podge very difficult to handle.

While employed as assistant engineer in the city engineer's office of Cincinnati, I fitted up a wagon as follows:

A box three feet long and one-half the width of wagon bed, in the rear left side, carried the stakes, sledge, pick and spade. Two heavy leather straps tacked on the side of this box carried the two axes. At the bottom of the dash-board and near the right side of same three holes, one inch square and covered with an iron plate, received the steel shoes of the flag poles. On the right side and on top of the tail-gate was fitted a piece of the very best rubber hose procurable, six inches long. The flag poles and target rod resting on this and held in place by a strap and buckle, were kept from bouncing around and wearing out on the tail-gate. The tripods we carried on the floor beneath the flag poles. A box about eighteen inches long, eight inches wide and six inches deep, fitting under the front seat, carried the tapes, pins and plumb-bobs. This box was divided by a strip three inches high length-ways through the center, making first a special division to receive the pins and tapes: on this strip and over the other division a strip was tacked in which were four holes of the right size to receive and hold in place the four plumb-bobs. With this arrangement, all articles except the instruments and the flag poles were usually left continuously in the wagon. At the office and at the stable places were provided for hanging the flag poles to keep them straight.

COST OF WATER PIPE.

We must replace our old cement supply pipe. What is the best for us to lay and the cost? The spring is a half mile away with a fall of 50 feet, and the present two-inch pipe is large enough.

P. Holmes, West Brookfield, Mass.

Cast iron pipe is in most common use. To allow for tuberculation in an iron pipe in case the protecting coating is injured, it may be well to increase the size somewhat, using say a 3-inch pipe. At present prices for pipe and with small freight on materials, the cost of the pipe laid would not be far from 30 cents a linear foot. Cement pipe of larger sizes, capable of carrying the pressure of 50 feet of water, are now made by enclosing an iron net in cylindrical form in a coating of cement. If there is no danger from water hammer, its use might be considered here.

MOVING TALL CHIMNEYS.

Please describe how to prepare foundation, what kind and size of rollers, and how to move a chimney about 75 feet high. *Colin S. Cameron, Sarnia, Ont.*

The method of moving a chimney does not differ from that of moving a large building, except that the weight may be concentrated on a smaller area, and thus require a greater spread of the blocking, if the soil is easily compressible. When the area which the foundation blocking must cover has been determined by testing or estimating the compressibility of the soil, a platform may be built on which the chimney rests during its travels. One method of getting the chimney upon this platform is to build a sort of cage, consisting of horizontal timbers resting on jack-screws and supporting two or more sets of shores extending up the chimney on all sides, which are well secured. Holes are then cut in the brick-work below, needles are inserted and jack-screws under them. These needles and the system of shoring are all then raised together high enough to allow the platform to be built underneath. The platform extends to the new location of the chimney.

Careful watch must be kept of the levels

of all parts during the operation, as a little more compression of soil or of wood in foundation in one place will cause a dangerous leaning of the chimney. The platform is usually supported on blocking in the manner common in moving buildings, and this blocking is put in place in similar manner, extending the area of ground covered as may be necessary. The chimney may be moved by sliding the timbers supporting it over the timbers of the platform, properly set, smoothed and lubricated for this purpose, or rollers may be used. In the latter case, the weight may be so great that wooden rollers would be crushed, in which case steel tracks and rollers must be provided. In this case a two-inch roller would probably be satisfactory. It is probable that the chimney could be slid along the platform timbers readily and thus save the expense of purchasing and setting the rails and rollers. The area of contact between the sliding timbers and the foundation platform must be proportional to the weight of the chimney. If the weight is sufficiently distributed, the ordinary 6-inch or 8-inch wooden rollers can be used. Careful computations and tests before beginning the work, made by an experienced man, are advisable, and also close watch of the level during the operation, as a slight change of level may throw the chimney out of balance. Chimneys and spires of over 200 feet height have been moved without any apparent deflection from the vertical. Jack screws acting against proper backing may be used to push the chimney forward over the ways. The motion is then entirely under control and will always be slow. In some cases cables and windlasses have been used, but the danger of sudden movements and consequent shocks and vibrations is much greater than when jack screws are used.

ARGUMENTS AGAINST MUNICIPAL OWNERSHIP OF ELECTRIC LIGHT PLANTS.

What book has arguments against municipal ownership of electric lighting plants?

Subscriber, ——, *Neb.*

Francisco's "Municipal Ownership, Its Fallacy" (paper, 50 cents), is such a book. Brooks' "Bibliography of Municipal Problems and City Conditions" (50 cents) gives names of many books and articles. Several articles upon this side of the subject have appeared in MUNICIPAL ENGINEERING. The following may be mentioned:

"Municipal Ownership of Street Lighting Plants," page 18, January, 1895.

"Opposition to Municipal Ownership of Lighting Plants," page 195, April, 1895.

"Cost of Lighting Cities," page 319, June, 1895.

"Examination of Financial Statements of Municipal Water-Works," page 10, July, 1898.

"Objections to Municipal Ownership of Lighting Plants," pages 321, May, 1899; 387, June, 1899.

"Comparison of Private and Municipal Electric Lighting Plants," page 243, April, 1899.

"Limitation of Municipal Ownership," page 343, December, 1899.

"Private versus Municipal Ownership," page 126, September, 1899.

"Municipal Ownership of Combined Water-Works and Electric-Light Plants," page 147, March, 1900.

"How Politics Detrimentally Affects Efficiency in Municipal Management," page 32, July, 1900.

"Cost of Municipal Lighting in Massachusetts," page 236, April, 1901.

"Public Lighting Symposium," page 18, January, 1901; page 78, February, 1901.

"The Agitation for Municipal Ownership," page 78, February, 1901.

"Proposed Municipal Telephone Scheme Rejected," page 46, January, 1901.

"Public Water Supplies," page 31, January, 1901.

A paper by Thos. D. Miller before the Southwestern Gas, Electric Light and Street Railway Association on "Municipal Ownership vs. Private Corporations" is published in the American Gas Light Journal for May 6, 1901.

ARGUMENTS IN FAVOR OF MUNICIPAL CONTROL OF PUBLIC UTILITIES.

Will you favor me with some references to arguments in favor of municipal control of water, lights, transportation, etc.?

L. A. Morton,
Arkadelphia, Ark.

In MUNICIPAL ENGINEERING the following articles will be found which consider phases of this question upon the side mentioned:

"Cost of Lighting Cities," page 319, June, 1895.

"Cost of Street Lighting," page 406, June, 1896.

"An Instance of Results of Municipal Ownership," page 124, February, 1896.

"Successful Public Water-Works Plant," page 216, October, 1896.

"Private and Municipal Ownership of Water-Works," page 367, December, 1896.

"Municipal Ownership of Water-Works at Oneida, N. Y.," page 380, December, 1896.

"Municipal Ownership of Water-Works," page 245, April, 1897.

"Municipal Ownership of Lighting Plants," page 377, June, 1897.

"Municipal Ownership and Permanence in Management," page 357, December, 1897.

"A Form of Municipal Control of Water-Works," page 275, May, 1898; 347, June, 1898.

"A Successful Municipal Lighting Plant," page 152. March, 1898.
"Municipal Ownership and Municipal Control," page 1, January, 1898.
"A Successful Substitute for Municipal Ownership," page 181, April, 1898.
"Plan for Municipal Ownership of Water-Works," page 157, March, 1898; page 49, July, 1898.
"Municipal Ownership," page 172, September, 1898.
"Ownership of Street Railway Tracks," page 241, October, 1898.
"City Ownership of Water-Works at Kingston, Ont.," page 42, July, 1898.
"Town Water-Works from a Financial Standpoint," page 341, December, 1898.
"Public Lighting in Massachusetts Mucipalities," page 401, December, 1898; page 236, April, 1901.
"Municipal Control of Water-Works in England," page 187, March, 1899.
"Comparison of Private and Municipal Electric Lighting Plants," page 243, April, 1899.
"A Mayor Who Advocates Municipal Ownership," page 266, April, 1899.
"Municipal Ownership of Water-Works," page 37, January, 1899.
"Objections to Municipal Ownership of Lighting Plants," page 387, June, 1899.
"Municipal or Private Ownership or Control," page 195, October, 1899.
"Municipal Ownership of Water-Works," page 87, August, 1899.
"Street Railway Franchises or Leases," page 298, November, 1899.
"A Municipal Street Railway," page 30, July, 1899.
"Chicago's Lighting Plant: Its Progress Under Municipal Ownership," page 33, January, 1901.
"Public Lighting," page 18, January, 1901; page 78, February, 1901.
"Municipal Ownership," page 216, April, 1901.
"Economy of Municipal Street Lighting," page 344, June, 1901.
"Public Water Supplies," page 31, January, 1901.
"Municipal Ownership," page 16, July, 1901.

Among the books of value in studying the question are "A Bibliography of Municipal Problems and City Conditions," by Robert C. Brooks (50 cents), giving names of many books and articles in periodicals and elsewhere on all phases of the subject, Foote's "Municipal Public Service Industries" ($1), Baker's "Monopolies and the People" ($1.50), Ely's "Problems of To-Day" ($1.25).

THE DEVELOPMENT OF BITUMINOUS PAVEMENTS, EMBRACING THE USE OF COAL TAR AND ASPHALT IN STREET WORK.*

By Fred J. Warren, Boston, Mass.

All forms of bituminous pavements, whether manufactured from natural or artificial asphalt, are in fact artificial stone pavements. The industry started with the use of the natural rock asphalt from the mines in the Val de Travers, Canton Neufchatel, Switzerland. The mines were discovered in 1721, but it was in 1849 that its utility as a road covering was first noticed. The rock was then being mined for the purpose of extracting the bitumen contained in it for its use in medicine and the arts. It is a limestone found impregnated with bitumen, of which it yields on analysis from eight to fourteen per cent. It was observed that pieces of rock which fell from a wagon were crushed by the wheels and under the combined influence of traffic and heat of the sun a good road surface was produced. A macadam road of asphalt rock was then made which gave very good results, and finally, in 1854, a portion of the Rue Bergere was laid in Paris of compressed asphalt on a concrete foundation. In 1858 a still larger sample was laid, and from that time it has been laid year by year in Paris. From Paris it extended to London, being laid on Threadneedle-st. in 1869 and Cheapside in 1870, and in successive years on other streets. It has also been extensively used in Berlin and other cities on the continent. The very fine texture of the stone, which is impregnated with bitumen, leaves a surface which is objectionably smooth, and the principal objection which is found in the use of rock asphalt in European cities is its slipperiness.

The early success of the asphalt movement in European cities led American contractors to seek the manufacture of an artificial asphalt which would have similar qualities, and the first idea was to utilize the tar produced at the gas works which was then almost without value. The result was about twelve to fifteen compounds varying only in detail, being all essentially composed of tar, or coal tar pitch, and sand, forming an artificial sandstone. Large quantities of these pavements were laid in Washington and other cities between 1870 and 1874, the stone pavements on Fifth-ave., New York City, being surfaced in this manner.

*A paper before the League of American Municipalities.

A large number of cities, especially in New England, use this artificial mixture successfully on sidewalks, and the coal tar sidewalk continues to be in greater use in Massachusetts than all other forms combined.

The result on street work was a general failure, and the impression has since generally prevailed that coal tar and its products are entirely unsuitable for roadway construction. The work was done at ridiculously low prices by contractors who had no previous familiarity with the construction of bituminous pavements or incentive to improve—and, in fact, at the time the pavements were laid, no one in this country or Europe had any accurate knowledge of the requirements necessary to produce good work. A few of these pavements, however, are in use today even on roadways, and have been in use longer than any asphalt pavement in existence in this country or in Europe. I think all failures can be traced to the use of inferior grades of coal tar, improper methods of preparing the cement, and the use of improper sand in the wrong proportions.

The early failure of the artificial asphalt pavements put them almost entirely out of use in roadway construction. A German chemist, Prof. de Smedt, had secured a patent on a formula for making a bituminous surface, using natural asphalt as a cementing material. Experiments were made with Mexican, Cuban and Trinidad asphalt; the so-called Albertite, Gilsonite and other bitumens found in this country, were also tried, but generally without success. Small samples of the Trinidad lake asphalt pavements were laid in Newark, N. J., and in New York City in 1870 and 1873 respectively, but it was not until 1876 that a pavement was laid on a large scale. Chemists generally knew that there were physical properties in asphalt which made it impossible for them, by any chemical test, to determine the durability or utility of any given asphalt, and no city could be induced to adopt this form of pavement until from actual test it had stood in Fifth-ave. in New York, with an average daily traffic of 13,000 vehicles, for several years.

In 1876 Pennsylvania-ave. in Washington was in an almost impassable condition, being covered with a rotten wooden pavement. Congress directed its repaving, and appointed a commission consisting of Gen. H. G. Wright and Q. A. Gilmore of the corps of engineers and Edward Clark, architect, to have supervision of the work. The terms of the law directed them to lay the best known pavements. They advertised for proposals, making no restriction as to materials. They received forty-one proposals for every variety of stone, wood, macadam and bituminous pavements. Out of them all the commission selected two and laid these respectively on two-fifths and three-fifths of the avenue. These were the natural rock asphalt from Neufchatel and the Trinidad lake asphalt mixture. Both pavements were completed in the spring of 1877. The Neufchatel pavement lasted about ten years, while the Trinidad lake mixture was not resurfaced until 1890.

Since 1876, under the present permanent form of government, the asphalt pavement has become the recognized pavement of Washington. It has spread from Washington to many other American cities, Buffalo, N. Y., taking the lead with something over three hundred linear miles, Philadelphia and New York City also laying large quantities each year.

Many other forms of asphalt have from time to time come on the market, and have been laid with more or less success. The physical differences which existed in the new varieties of asphalt made it necessary for their promoters to develop new formulae, and to endure many poor pavements laid during the experimental stages and under close competition. Some of the new varieties are undoubtedly inferior to the Trinidad while others give every indication of developing into superior pavements.

It seems to be a fact that the early asphalt pavements caused as much annoyance to the promoters as did the early coal tar pavements, but they were generally laid at a good margin of profit, under a guarantee system which justified and encouraged the most careful methods and immediate repair of defects; and considering the complications presented in the manufacture of the bituminous surface, it is to the credit of the established paving companies that they have succeeded in laying asphalt pavements so satisfactorily.

The business was developed during the past twenty years from one of insignificant proportions to an industry carried on in about one hundred and twenty cities in the United States. There has not been time to develop an organization sufficiently expert to always accomplish success, the commercial end of the business requiring so much of the energy of those embarked in it that it has been very difficult to give the proper amount of attention to the scientific development, but it can be expected that during years to come the manufacture of bituminous pavements will be so perfected that nothing better can be wished for. Year by year greater uniformity has been accomplished, taking the industry as a whole, and the average cost of maintainance has been largely reduced on pavements laid in recent years over the earlier pavements at the same age. As late as 1885 some of the pavements laid by the most experienced companies were com-

plete failures when first laid and the cost of repairs during the first five years sometimes amounted to twice the original cost of construction of the wearing surface, while the average cost of the most experienced companies for the maintenance of pavements laid since 1890 will hardly average 5 per cent. of first cost of surface during the first five years, and the pavements are frequently in perfect condition without repair at the end of that period. When it is considered that slight variation from the proper proportions of ingredients brings about disastrous consequences, the improvements are quite remarkable. In 1885 no one knew what consistency of bituminous cement should be used and many failures occurred from the cement being tempered too soft—when the surface would crack and wear off—and until 1890 there was no accurate method of determining or recording the softness of the cement. Probably the greatest failures were due to improper selection of the sand or mineral grain. Sands which careful analysis show to be very different are frequently so closely alike in appearance that the most expert eye could not detect the difference. There was no record kept of the nature of the sand until recent years, almost any sand being considered suitable.

All forms of bitumen are subject to decomposition, evaporation or oxidization on exposure. The change is slow in bulk and a noticeable change in bulk may take centuries. The bitumen is used to surround the grains of mineral matter for the purpose of cementing them together. In the Richardson patent formula, used in the Trinidad lake pavement, the mineral grain is so fine that the aggregate surfaces of the grains to be coated approximate one thousand square inches to each cubic inch of the wearing surface, and the coating of bitumen around each grain is about one-four-thousandth of an inch in thickness. If the sand is not of such graded sizes that the voids are approximately filled by the bitumen used, then on exposure in such minute particles early failure is quite certain on account of evaporation and decomposition. A slight variation in the size of the grains makes a great difference in the area of grains to be coated with bitumen and, in turn, in the thickness of the coating when a given portion of bitumen is used, and consequently upon the length of time which it would take to change its physical condition on exposure. So great is the difference that a given bulk of sand, of an even size, passing a No. 200 screen, contains about thirty times as much surface to be coated as does the same bulk standing between a No. 10 and No. 20 screen, and about one thousand times as much surface to be coated as does the same bulk of grain passing a two-inch screen and standing on a one-inch screen. In the effort to duplicate the Neufchatel pavement the entire development and practice has been to exclude from the bituminous mixture all mineral grains coarser than about one-twentieth inch in diameter.

A form of bituminous roadway known as tar macadam has been used in England with very variable results for more than thirty years, and also in a few American cities. The process employed is defective in principle and does not accomplish uniformity. I feel that there is little permanent merit in the use of crude tar, or in coating stones of even sizes laid in courses, with an effort to roll the several courses together, as the very life of the bitumen depends upon its proper selection, preparation and use, in proper proportions, with a dense mineral mixture. Considerable investigation has convinced me that both practices are wrong and that the future development of bituminous pavements will be along the line of using a coarser mineral aggregate than is used in the asphalt pavement, and more modern methods than are employed in tar macadam.

The advantages of a coarse grain are:

1. The coarse grain gives rigidity in itself not acquired by fine grains, and also gives a surface that will not wear slippery.

2. It is therefore possible to use a softer cement, which will have longer life.

3. A heavier coating will be secured around each grain which will tend to increase the life of bitumen if exposed.

4. The voids can be greatly reduced, thereby avoiding exposure of bitumen in minute particles.

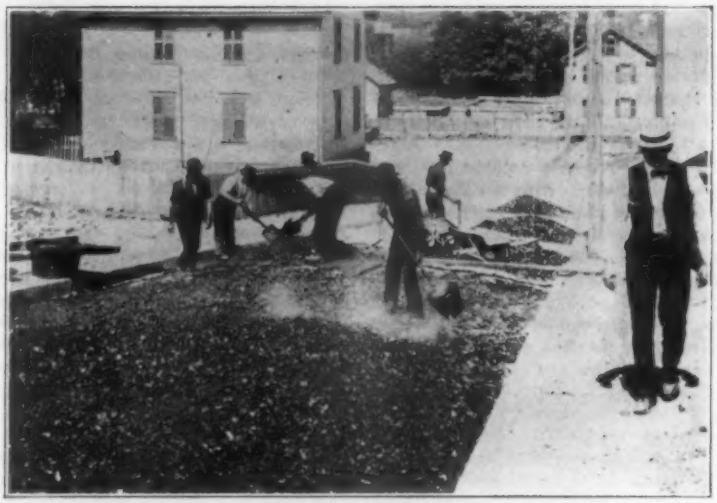
5. Lower temperature can be used in mixing with consequent saving in fuel and labor.

6. Less danger of injuring the bitumen by overheating in the process of making cement or mastic.

The mixture to be used in any particular piece of work should always be determined by experts who will recognize the conditions present, and the special treatment necessary, as the complications are many. Under proper instruction failures would be reduced to a minimum.

A pavement constructed on above principles would be a bituminous concrete pavement, as distinguished from the bituminous mortar surface of the asphalt pavement.

Owing to the nature of the mixture I think the best forms of coal tar, properly treated, will furnish the best form of bituminous cement for such a pavement. The coarse stone used should be the hardest procurable, and I can see no reason why, under proper development, the bituminous cement will not bind the mineral matter



LAYING WARREN'S BITUMINOUS MACADAM WATERPROOF PAVEMENT,
PAWTUCKET, R. I.

WARREN'S BITUMINOUS MACADAM WATERPROOF PAVEMENT,
MAPLE STREET, HOLYOKE, MASS.

together until the stone itself wears out under moderate traffic. I should not advise placing such a pavement on the heaviest traveled streets of large cities at the start. It would be best to develop perfection under more moderate usage.

I think the term Bituminous Macadam is a suitable name for such a pavement, as it contains all of the good points of a first-class macadam road with durability and cleanliness added, and owing to the coarse grain, it is not as slippery as other forms of bituminous pavements.

An equipment of $3,000 to $4,000 in machinery would be sufficient to lay 800 to 1,000 square yards per day of bituminous macadam, and municipalities under proper supervision could do the work themselves much cheaper than by contract.

The largest sample of pavement laid on this plan is in the enterprising city of New Bedford, Mass., where your worthy vice-president is considering municipal ownership of a bituminous macadam plant in connection with one of the best equipped city yards in this country. Lowell, Mass., has also borrowed a plant to construct 5,000 yards or more, and Holyoke, Mass., has tried a block and seems well pleased. The city of Pawtucket, R. I., was the first eastern city in recent years to try the use of tar on its streets, doing the work itself under an old formula, but has recently had a sample of bituminous macadam laid on above plan. Mr. Carpenter, the city engineer, was not satisfied with the lack of life of his first work, but he accomplished better results than others who have experimented on their own account.

In addition to these pavements already laid investigations along the same lines are being followed by cities all over the country, and while I have been convinced that the present methods of paving are open to decided improvement it is surprising that such radical departures should have met with such a general response, showing that the public is not satisfied with any pavement yet devised.

It is not to be expected that perfection will be secured at once, but the additional knowledge being acquired by the present method of recording conditions gives encouragement to the belief that in the future bituminous concrete or mortar pavements will come nearer filling the needs on all classes of streets and roads than any other form of pavement yet devised.

MUNICIPAL MATTERS IN COURT.

[Prepared for MUNICIPAL ENGINEERING MAGAZINE by Andrews & Murdoch.]

Acquiescence in Constructing Sewer.—Acquiescence in the construction of a sewer will not estop persons injured from complaining of a nuisance created by the sewer polluting the stream into which it emptied. Donovan vs. Royall et al., 63 S. W. Rep. (Tex.) 1,054.

Use of Streets.—The mayor and city council of a city hold the streets in trust for the benefit of the public, and have no right to authorize their use for a private purpose. Townsend et al. vs. Epstein, 49 At. Rep. (Md.) 629.

Estimating Damages.—Commissioners of estimating and assessment, in determining the value of premises taken on opening street, may act on their own personal view, and are not concluded by the testimony of experts. In re-opening Trinity-ave., 71 N. Y. Supp. 24.

Awarding Contracts.—In awarding city contracts, where there are no arbitrary statutory regulations, a city council has a large measure of discretion. In reviewing such action, the courts will only inquire into the good faith and honesty of its exercise. State (Ryan, prosecutor) vs. Mayor, etc., of City of Paterson et al., 49 At. Rep. (N. J.) 587.

Donation of Forfeited Money.—Money forfeited to a city for failure of a street railway company to comply with a franchise, and improperly donated by the city to another company belongs to the city, and the state revenue agent may recover it from such company. Adams, state revenue agent, vs. Jackson Electric Railway, Light and Power company, 30 So. Rep. (Miss.) 58.

Legislative Determination of Necessity of Street Improvement.—After street work is done, the legislative determination of the council that the improvement was necessary will not be disturbed, except upon a showing of abuse of discretion so conclusive as to amply justify the interference of the court. Barfield et al. vs. Gleason et al., 63 S. W. Rep. (Ky.) 964.

Approval of Contract.—A statute providing for the construction of streets at the cost of abutting property-owners is not unconstitutional because it does not require the contract for such construction to be approved by the city council, as that is a ministerial act and may be entrusted to an executive board. Barfield et al. vs. Gleason et al., 63 S. W. Rep. (Ky.) 964.

Release of Bidder.—Where the city, without good cause, released an accepted bidder,

who had given bond with solvent surety, and the bid accepted upon a second advertisement, though the lowest one then made, was considerably higher than that of the released contractor, the property-owners are entitled to judgments over against the city for the difference. Barfield et al. vs. Gleason et al., 63 S. W. Rep. (Ky.) 964.

Forfeiture of Work.—Money forfeited to a city for a failure to comply with a franchise becomes the property of the city for general purposes, and a donation thereof to another company completing the work of the first company was void, as violating Const. sec. 183, prohibiting any county, city or town from making appropriations in aid of any railway or other corporation or association. Adams, state revenue agent, vs. Jackson Electric Railway, Light and Power company, 30 So. Rep. (Miss.) 58.

Passageway Over Streets.—Where defendant owned stores on opposite sides of a street, and constructed a passageway over the street for the conveyance of his help and customers in passing from one store to the other, such use of the street was for a private and not a public purpose, and an ordinance authorizing the construction of such passageway was invalid. Townsend et al. vs. Epstein, 49 At. Rep. (Md.) 629.

Booths in Streets—The legislature may empower a city to permit a citizen to erect a booth for the sale of newspapers under the stairway to an elevated railway station, which does not obstruct the use of the street except for the space of about one foot at one end thereof, since it is not such an appropriation of the street for private purposes as will constitute a nuisance. People ex rel. Pumpyansky vs. Keating, commissioner of department of highways, 71 N. Y. Supp. 97.

Extent of Assessment.—Laws 1897, c. 378, control condemnation proceedings of the City of New York, where the preliminary report of commissioners was filed after Jan. 1, 1897, and the commissioners therefore may, under sec. 980 thereof, assess the benefit on premises along the line of the improvement to the extent of one-half their value as determined by the commissioners. In re Townsend-ave., 71 N. Y. Supp. 201.

Publications in Sunday Papers.—Under Denver city charter, art. 2, sec. 8, providing that no ordinance shall take effect until published in some newspaper of general circulation, or in a book or pamphlet, one publication in a Sunday newspaper of an ordinance authorizing the construction of a sewer is not a sufficient publication to support an assessment therefor, since a Sunday publication is of no effect. Dumars et al. vs. city of Denver et al., 75 Pac. Rep. (Col.) 580.

LAYING WARREN'S BITUMINOUS MACADAM, PAWTUCKET, R. I.

Deposit of Rubbish.—A city, under license from the owner of a lot adjoining plaintiff's, deposited on such lot certain rubbish. An ordinance prohibited the placing of rubbish injurious to the public health on or near any highway. Held, such ordinance is not conclusive of plaintiff's right to recover in an action for creating a nuisance, but is material only on the question whether the act of the city was reasonable. Lane vs. city of Concord, 49 At. Rep. (N. H.) 687.

Proportion of Benefits to Assessment—A street assessment will not be held to be an arbitrary and unconstitutional taking of

property merely because the benefits from the street are not commensurate with the cost, as the legislature has a large discretion in defining the property deemed to be specially benefited, and the courts will not interfere, except upon a showing of fact so conclusive as amply to justify their interference. Barfield et al. vs. Gleason et al., 63 S. W. Rep. (Ky.), 964.

Pollution of Creek by Sewer—Where a city, authorized to provide a system of sewerage, granted a franchise therefor, and provided a terminal in a creek flowing through plaintiff's land, an injunction was properly granted restraining the maintenance of such terminal, the sewage having polluted the water, rendering it unfit for domestic use and for drinking water for cattle, and the refuse matter contaminating the grass so that cattle would not eat it. Donovan vs. Royall et al., 63 S. W. Rep. (Tex.), 1,054.

Selection of Material—It is the right of a municipal body to select and have such quality of material for use in pavements as they, in the honest exercise of the discretion vested in them, may require. The council could, under the specifications, reject any bid, and they had an absolute discretion to do so if the quality of the materials proposed to be used by a bidder were not, in their opinion, under his admissions, or under the proofs, up to the standard required. State (Ryan, Prosecutor) vs. Mayor, etc., of City of Paterson et al., 49 At. Rep. (N. J.), 587.

Interest on Contract Work—Laws 1900, c. 678, authorized the board of estimate of New York City to pass on a claim of plaintiff for contract work which he had performed and directed the comptroller to pay the sum certified to as the reasonable value of the work. Held, that plaintiff was entitled to interest on such sum from the time of the performance of the work. Coughlin vs. City of New York, 71 N. Y. Supp. 91.

Collection of Assessments—Where assessments have been made on abutting property to defray local improvements, and no fraud is alleged, the city and contractor will not be enjoined from collecting the assessments unless the proceedings are void, as, under Burns's Rev. St. 1894, section 4,274, requiring the common council to determine what property is benefited and the extent of the benefit, its decision cannot be attacked collaterally except for fraud. City of Greensburg et al. vs. Zoller et al., 60 N. E. Rep. (Ind.) 1,007.

Limit of Assessment—The act of 1889, known as the "Barrett law," provides that expenses of street improvements may be assessed on property benefited thereby in proportion to the benefit received and without regard to the value of the property. Held, that the law is not repugnant to Const. art. 1, sections 21, 23, providing that no man's property shall be taken without just compensation. Martin et al. vs. Wills et al., 60 N. E. Rep. (Ind.) 1,021.

Steam Roller on Street—Leaving a steam roller close to the curb on the street where it is in use, for two days after it is broken, without any change in its appearance to enhance the danger of frightening animals, except by putting over it the usual canvas cover to protect it from the weather, does not prevent a case of negligence for the jury, when a horse becomes frightened by its presence in the street. District of Columbia vs. Moulton, 21 Sup. Ct. Rep. (Us. S.) 840.

Obstructing Stream—Where, in an action for damages caused by water flooding plaintiff's cellar through the alleged negligence of defendant in stopping the flow from an adjacent lake, the report does not show that the fact that plaintiff's cellar was below the established grade, as provided by statute, contributed to the injury, and there was evidence to the contrary, it was error to direct a verdict for defendant, since plaintiff's violation of the law would not prevent a recovery if it did not contribute to the injury. Biggio et al. vs. City of Boston, 60 N. E. Rep. (Mass.) 938.

Acceptance of Work—As the statute authorizes the "deputy or deputies" of the board to receive or reject the work, and the chief engineer was, when elected, given power, by order of the board, to receive or reject work as agent of the board, the assistant engineer appointed by the board may, when acting in place of the chief officer, accept the work; and, in any event, his action may be ratified by the subsequent action of the board approving the report of inspection and reception of the work. Richardson et al. vs. Mehler, 63 S. W. Rep. (Ky.) 957.

Conformance of Street Car Tracks to Grade—The tracks of a street railway company, required by ordinance to conform to the grades of the streets, were above the grade, and the mayor of the borough found employes of the company at work on the tracks, and was told by the foreman that they were raising the tracks whereupon the mayor ordered him to desist. Held not sufficient to authorize an injunction restraining the mayor and council from interfering with the work of the company on its tracks. Bayliss et al. vs. Newark & H. Traction company, 49 Rep. (N. J.) 589.

Engineer's Decision—A building contract with a borough provided that, if the contractor failed to complete the work at the time specified he should forfeit as liquidated damages, the amounts named in each of the detailed specifications for the different portions of the work. Another stipu-

lation declared that should any disagreement arise as to the meaning of the drawings or specification on any point, or as to the character of the work, the decision of the engineer should be conclusive on all parties to the contract. Held, in an action on the contract, that the engineer had no power to determine the claim of the borough for damages resulting from the contractor's delay. Chandley et al. vs. Borough of Cambridge Springs, 49 At. Rep. Pa.) 772.

Enforcing Lien for Street Assessment—Though a change in a city grade was unnecessary, and might have been prevented by injunction, and though the excavations necessary to conform to the grade might have been prevented until compensation had been provided for the injury to be occasioned thereby, yet, as neither of these things was done, the defendants in an action by the contractor to enforce his lien cannot have the cost of the excavation, which has been included in the assessment, apportioned among them, and recover against the city the amounts apportioned, the remedy being an action at law to recover the damages which have actually accured from the change of grade. Barfield et al. vs. Gleason et al., 63 S. W. Rep. (Ky.) 964.

Ordinance Providing for Pavement—An ordinance providing that the carriageway of a certain street, from the center line of one street to the center line of another street, shall be of a certain width, "and shall be improved by grading, curbing, and paving with vitrified brick or block pavements, with corner stones at the intersections of streets and alleys, and footway crossings across all intersections of streets and alleys, in accordance with the plans and specifications on file in the office of public works," sufficiently designates the exten lic works," sufficiently designates the extent and character of the improvements, though the plans and specifications referred to were not in existence, when the ordinance was passed, and cannot, therefore, be considered in aid thereof; the ordinance being sufficient without reference to plans and specifications. Richardson et al. vs. Mehler, 63 S. W. Rep. (Ky.) 957.

Constitutionality of Assessments—Special assessments for street improvements do, in practical effect, take property for public use without compensation, and therefore deprive the owner of such property without process of law, unless the property assessed is benefited by the improvement to an extent substantially equal to the amount of the assessment. Each case arising under the laws for assessing abutting property to pay for street improvements depends upon its particular facts. If it appears that an assessment has been levied by competent authority, and that it is fair and not in substantial excess of the benefits to accrue to the property by reason of the improvements, it will be sustained by the courts; but it is equally the duty of the courts to restrain the collection of assessments which are shown to be mere attempts to take the property of one, for the use of others, without compensation to the owner. White vs. City of Tacoma, 109 Fed. Rep. (U. S.) 32.

CURRENT INFORMATION

A New Method of Naming Streets.

Capt. Lansing H. Beach has proposed a new system of naming the streets in the District of Columbia outside the city limits of Washington, which has some manifest advantages for application in any city. Part of the order reads as follows:

North and south streets will be designated by numbers, the present city system being extended into the country.

East and west streets will be named for distinguished Americans. Taking East Capital-st. as a dividing line, and running north, names of one syllable will be used, arranged in alphabetical order. Upon completion of the one-syllable series a two syllable series will begin, and upon completion of this a three-syllable series, until the northern limit of the District of Columbia is reached.

East and west streets in the country south of the line of E. Capitol-st. will be named with the letters of the alphabet. Upon completion of this a series of one-syllable names of American cities or prominent geographical objects, arranged in alphabetical order, will be started, and so on, until the southern limit of the District of Columbia is reached.

A minor or place street will be designated a "place" and will bear the number or initial of the nearest parallel main street between it and the capitol.

The broad diagonal highways will be designated avenues and will be named after the states and territories of the Union.

Streets which are irregular in direction, or curved to an appreciable extent, will be termed "roads" and will be named after some prominent local feature in their vicinity, or other distinguishing designation.

The object to be attained in making the change is uniformity throughout the district. In time the commissioners hope to

have their system of one-syllable names extend into the city for all streets north of E. Capitol-st., and the corresponding line in the western section of the city. South of E. Capitol-st. and in the southwest also the lettered system would be maintained.

The list of street names which Engineer Richards has submitted is as follows:

One-syllable streets—Ames, Blaine, Clay, Dix, Eads, Foote, Grant, Hayes, Jay, King, Lee, Meade, Nash, Ord, Polk, Quarles, Rusk, Scott, Taft, Uhl, Vane, Wirt, Yates and Zane.

One-syllable places—Ashe, Bell (Brown), Chase, Dodge, Ernst, Field, Gates, Holmes (Hoe, Howe), James, Kent, Low, Meigs, Neal, Orth, Pierce, Quayle, Reed, Swain, Todd, Ure, Vail (Vroom), Wayne, Yost and Zahm.

Two-syllable streets—Adams, Bryant, Calhoun, Douglas, Evarts, Fulton, Garfield, Hamlin, Irving, Jackson, Kearney, Lawrence, Monroe, Newton, Otis, Perry, Quincy, Randolph, Shepherd, Taylor, Upham, Verplanck, Webster, Yancy, Zeigler.

Two-syllable places—Alcott (Astor, Allen), Benton, Channing, Dana, Edwards (Edmunds), Fremont, Girard, Hooker, Ingalls, Johnson, Kendall, Lamar (Logan), Manning, Newcomb, Osgood, Putnam, Quintard, Rogers, Sherman, Tyler, Upshur, Vickers, Warren, Yeaman, Zulick.

Three-syllable streets—Allison, Buchanan, Crittenden, Decatur, Emerson, Farragut, Gallatin, Hamilton, Ingraham, Jefferson, Kennedy, Longfellow, Madison, Nicholson, Oglethorpe, Peabody, Quackenbos, Rittenhouse, Sheridan, Tuckerman, Underwood, Van Buren, Whittier.

Three-syllable places—Audubon, Butterworth, Cameron, Davenport, Everett (Edison), Fessenden, Garrison, Harrison, Iverson, Jenifer, Kingsbury, Linderman, Montgomery, Nicolay, Overton, Patterson, Quitman, Robinson, Stevenson, Tarkington, Underhill, Venable, Worthington.

Minneapolis to Refund Excess Over Actual Cost of Improvements.

The supreme court of Minnesota has handed down a decision that will probably cost the cities in that state a vast amount of money. The city of Minneapolis will be compelled to refund a sum ranging from $200,000 to $300,000, and other cities will in all probability be similarly affected. Former Governor Pillsbury brought suit some time ago to restrain the city of Minneapolis from collecting more than the actual cost of sewers laid in the street in front of his property. He won the case in the district court, and the supreme court has sustained the decision of the lower court. Under that decision no property-owner can be assessed for a sewer or other local improvement in excess of the actual cost of such improvement. The meaning of this is that every property-owner who, during the past six years, has paid any assessments in excess of the actual cost of the improvements on which he was paying is entitled to a rebate equal to the excess. It is stated that in the case of Minneapolis it will cost $10,000 to hire men to ascertain the amounts of these rebates. The city council has held meetings to provide ways and means of accomplishing the work imposed by the decision and has recommended that the board of tax levy provide for the extra sum in the annual budget.

The last legislature in Minnesota passed a law requiring cities to refund to tax-payers any excess over the actual cost of improvements. The city charter in Minneapolis also contains a provision limiting the cost of water mains. In the case of sewers the city engineer has been making estimates and when there was a surplus that surplus was credited to the general sewer fund.

An English Plea for Motor Vehicles and Good Roads.

That horses cause more road wear than do wheels and atmospheric causes is, generally stated, the verdict of Mr. W. Worby Beaumont, an English engineer, who has made a special study of the maintenance of roads. He is also one of the leaders of the automobile movement in England. Before a recent meeting of engineers Mr. Beaumont read a paper on "Points as to Wear on Roads Caused Respectively by Horse Haulage and Motor Traffic." The paper is given in The Surveyor and Municipal and County Engineer, together with the discussion that followed.

Not all of the debaters agreed with Mr. Beaumont in his general conclusion, but his contention was well supported by illustrations from his own experience and by a citation from old reports on road wear. The select committee on steam carriages in 1831 found that 20 per cent. of the road wear is due to atmospheric causes, from 20 to 35.5 per cent. to the wear of wheels, and from 44.5 to 60 per cent. to the action of horses' feet. Mr. Beaumont says that these figures are only roughly approximate and that, while they were compiled many years ago, they will, with a few exceptions, hold today. When roads are particularly well made and kept, the changes due to the atmosphere and the action of wheels are less, and the changes due to horses' feet are more, than in the table quoted. On most roads the effect of the hammering of horses' shoes is to loosen the surface, and what the shoes begin the wheels help to complete. The drift of the whole argument is for the use of motor vehicles in order that

a large percentage of road wear may be removed.

Mr. Beaumont also argues for well-made and well-maintained roads, width of tires ample in proportion to the load on them, the use of rubber tires generally, and the use of light-load motor vehicles, which may insure their earning capacity by rapidity of transit rather than by weight of load. The conditions of modern life demand vast improvements in highways, and the introduction of motor vehicles will be both a cause and an effect of a betterment of the roads. To the lessened cost of repairing the roads when motor vehicles are in use may be added the decreased cost of scavenging and the hygenic value of not having horses on the streets and highways. The speaker concluded his remarks with the statement that in England there is nothing on which the county councils "can spend money more profitably than on the proper construction and efficient maintenance of good roads"—a statement that will hold almost universally in America.

Oil and Street Dust.

Some public-spirited citizens of Columbia, S. C., recently at their own expense made an experiment with crude petroleum as a means of keeping down dust on macadam streets. A section of street was chosen for the operation and a paint sprinkling pump, with hose and nozzle, was used to distribute the oil. The oil promptly soaked into the macadam and at the end of the first day there was not the slightest indication of dust either from hoofs or wheels when vehicles passed along the section operated on. The report of the experiment did not indicate how long a time the oil kept the dust laid, but did say that the men behind the venture were thoroughly satisfied with the results obtained.

Syracuse Wins in Assessment Suit.

In 1894 the city of Syracuse, N. Y., let a contract for paving W. Genesee-st. The contract specified that only brick made by the New York brick and paving company should be used. Jacob Amos, who was then mayor, owned a majority of the stock in the brick company. The property-owners along the street brought suit to have the assessment set aside and declared illegal because only one kind of brick was named. It was claimed that this shut out all competition and made the contract illegal. Several attempts were made to have the legislature straighten out the tangle, but the matter dragged along through the years and finally suit was brought by the property owners. Justice Merwin of the supreme court has held that the assessment made by the city must stand.

Buffalo Brick Streets Must Be Awarded to Lowest Bidder.

In Buffalo, N. Y., it has heretofore been the practice of the city council to award the contracts for the paving of streets with brick to the bidder who was the choice of a majority of the property-owners interested. This condition arose from the indefiniteness of specifications as to particular brands of brick to be used. In a majority of the cases the contracts were not let to the lowest bidders. Suit was brought recently to force the council to accept the lowest responsible bid on a certain street, and Justice Kruse sustained the contention. The improvements on several streets must be readvertised unless a higher court overthrows the decision.

Milwaukee Claims Right to Choose Brick for Street Contract.

R. J. Hickey, a Milwaukee contractor, was given the contract recently for paving a part of Hind-st. in that city. The specifications stated that the contractors might have a choice of any one of the eight makes of brick that had stood the city test. Mr. Hickey made no choice in his bid, but, as lowest bidder, he announced his intention of using a certain kind of brick, presumably one of the cheaper grades. Two of the aldermen raised the contention that, inasmuch as the bid specified no particular brick, Hickey might be compelled to use any one of the eight kinds. City Attorney Runge, when appealed to, handed an opinion to the board of public works in which he decided that the aldermen were right. The new pavement will now be of the same kind of brick as the part that has already been laid. The decision cost the contractor $1,100.

Chicago Improvement Board May Order Asphalt.

Corporation Counsel Walker of Chicago has rendered to the board of local improvements an opinion, according to which asphalt pavements may be ordered in the business district as a public necessity. The opinion was in answer to a question by the board as to its power under the special assessment law to compel property-owners to resurface worn-out granite pavements with asphalt. The decision will have an important effect on the pavement question in the downtown district.

Property-Owners Must Pay.

The supreme court of Illinois has decided that the time for property-owners to raise objection to the manner of constructing public works is before the works are finished and that, if such work is improperly done and no objection is raised before its completion, property-owners must pay. The decision was given in reversing a case appealed from the county court in Chicago.

Suit was instituted to evade the payment of contractors for work poorly done on W. Lake-st. The lower court decided in favor of the property-owners, but the higher court has ruled that they can be held for payment on the ground that the contractors are paid in bonds which are transferable and get into the hands of the people who have nothing to do with the improvements. If action is taken by the property-owners before the work is completed they can have redress from the city or the contractor.

New Gravel Road Law in Indiana Delays Improvements.

The last session of the Indiana legislature passed a new gravel road law. It provides that a new gravel road in any township must first have the majority vote of the township. A gravel road election was held recently in Owen township, Clinton county, and the project for building a new road was defeated. The road is badly needed and Owen township has the reputation of being progressive, but that part of the township already having its gravel roads strongly opposed the new tax and defeated it. It is thought from this election that it will be impossible to build gravel roads under the new law except in very rare cases.

The Break in the Brooklyn Bridge.

The breaking of several of the suspension rods on the north cable of the Brooklyn bridge on July 24 has caused widespread comment as to the durability and safety of that structure. The accident caused wide excitement for a time and many rumors in New York were put afloat about the danger of using the bridge again. Chief Engineer Probasco of the Department of Bridges in New York City, said that the breakage was due to expansion, presumably from the heat. All damage was repaired within two or three days and the bridge is considered safe again. It has long been the opinion of experts that portions of the bridge are constantly overloaded and this accident gives color to their belief.

Opposition to Sewage Irrigation in Los Angeles.

The municipal council of Los Angeles, Cal., some weeks ago passed an ordinance permitting the sale of sewage by the city for irrigation purposes. The action has caused a loud outcry on the part of the people and the courts will be resorted to to stop the procedure. The district where the sewage is used to irrigate vegetable farms lies immediately south of Los Angeles and it is asserted that the citizens living closest to the pollution are compelled to close their houses tight against the nightly stench arising from hundreds of acres spread over with liquid sewage.

The superior court of the county in which Los Angeles is situated has declared that the wholesale irrigation of table vegetables close to thickly populated neighborhoods is a nuisance and a menace to the public health. In one locality under that decision a perpetual injunction has been granted against the practice. The local board of health has condemned the action of the council and physicians seem to be a unit in declaring that the condition is fraught with great danger. Those most interested in a continuation of sewage irrigation are a number of land owners and all the Chinese market gardeners that work patches in the district affected.

Sewerage Assessment Plan in Brockton, Mass., Upheld.

The United States supreme court has affirmed the decision of the superior court of Massachusetts in regard to the sewerage plan in force in Brockton, Mass. Both courts uphold the plan. Under this scheme the entire cost of the sewerage system is divided between the city at large, which pays one-fourth, abutting property, which pays a second fourth on a combined area and frontage basis, and the users of the sewers, who pay the remaining half of the cost in quarterly rentals.

One Way of Mastering Quicksand.

The story of the surmounting of a quicksand difficulty in building a sewer in West Roxbury, Boston, last year will be of interest to city engineers. A surface drain was being constructed for Goldsmith brook and a bed of quicksand was found to extend sixty feet below the grade of the conduit. Borings showed no stratum of gravel through which water could be pumped out of the sand. Tubular wells were sunk twenty feet and more below grade, and surrounded by gravel, through which the water from the quicksand filtered to the well. This was accomplished by first sinking a ten-inch pipe by means of a water jet and then placing inside of it a two and one-half-inch pipe perforated for five feet at the bottom. The space between was filled with coarse sand and the exterior pipe was withdrawn. In this manner the perforated pipe was left surrounded with the coarse sand. A steam ejector nozzle placed at the bottom of the well and connected with a smaller pipe in the interior of the two and one-half-inch pipe was then used to draw out the water which filtered through the perforations.

Chicago Landlords to Buy Garbage Cans.

Justice Duggan of Englewood, Ill., has ruled that the landlords and property owners of Chicago must buy garbage receptacles for

the use of their tenants. A resident of the district was arrested to make a test case of the matter. The justice further ruled that the defendant should buy a garbage can and then hold the price of it out of the rent at the end of the month. The court volunteered the information that he would issue no writ in case the landlord brought action for eviction. A Chicago ordinance provides that every building must have a garbage can, and the Englewood decision, if upheld, will mean the expenditure of thousands of dollars on the part of Chicago landlords and real estate agents.

The Chicago North Side police some days ago began a crusade against wooden garbage boxes. The new law provides for metal cans, and the residents were given five days in which to buy the new kind of receptacles. At the end of the time the police went along the alleys with axes and wagons and destroyed and hauled away the wooden boxes which had not been removed.

Improvements in Erie, Pa.

Movements in Erie, Pa., for the correction of the sewerage evil in that city and for track elevation have now some promise of success. The supreme court of that state recently held as legal the issuing of bonds for city improvements without the necessity of referring each separate issue to the people for a vote at a general election. This decision makes it an easier matter to put improvements through. For years the sewage of Erie has been flowing into Mill creek and the situation has been growing graver every year because of the contamination of the water supply. There is also a general movement for the abolition of grade crossings. The railroad companies are prepared to do their part of the work and it is thought that track elevation will soon be an accomplished fact.

Negative Vote on Sewer and Light Propositions at Columbus, O.

The voters of the city of Columbus, O., have refused by a decisive vote the appropriations for intercepting sewers and sewage disposal works and for erecting a municipal electric light plant. The former was probably defeated on account of the great estimated cost, $2,500,000.

Difficult Water Pipe Laying at Pittsburg.

A difficult piece of work, done by a local contractor, was the laying of a 42-inch influx pipe for the Pennsylvania Water Company, at Wildwood, on the Allegheny river. The entire task consisted of the sinking of two large cribs or filters and 480 feet of pipe which weighs 400 pounds to the foot. The cribs and piping had to be sunk at one time. The two cribs were each five feet six inches deep by 48 feet wide and 480 feet long, with 480 feet of 42-inch pipe connected to the cribs by four connections. This work was done above water and 1,000 feet of the same size pipe extending from the crib to the pump station was laid under water by divers.

John H. de Carpentier, a member of the contracting firm, took charge of the work, which began last March. The cribs were filled with different kinds of filtration apparatus and supported the connecting pipes. It took seventy-five men almost five months to complete them.

While the cribs were being completed two local divers were engaged and the work of laying the 1,000 feet of pipe under water was commenced. First, the huge excavation in the river bank at Wildwood was braced, then the connection for the pumps place in position, after which the first length of pipe was placed in the hole. As each length of pipe was lowered to the bottom of the river by a crane a diver would go down with it, and after bracing it in position he would come to the surface for fresh air and his place would be taken by another diver, who would enter the water and caulk the joints. For this work lead and oakum were used. It took a long time to complete the laying of this underground tunnel, as a man was unable to stay under the water more than half an hour at a time and the work of caulking the pipe was very slow, as the heavy diving suits worn by the divers made it impossible to work rapidly.

Eighty-four lengths of pipe were used in this work, each length weighing 4,800 pounds, and on account of the enormous weight the handling of it above water was rather slow. By the time this pipe had been laid the cribbing had been completed and the work of laying the heavy pipe between these and connecting them to the cribs was commenced. To do this the cribs were fastened together a few feet apart and heavy trestle work built between them on which the pipe was hung by ropes. As each length was put in place it had to be caulked to the other before another could be hoisted. When the entire line of pipe had been completed and made ready for sinking, several barges of rough gravel and stone were landed alongside of each crib and men started to unload this on top of the cribs. Before this work was started, however, a man had to be stationed on each of the trestles to which the pipe was hanging, as the entire weight was by this time depending on the ropes and as the cribs sank these ropes had to be slacked off and the work once started had to be continued until the entire line lay on the bottom of the river. It

took two days to sink the cribs and pipe. The entire work consumed about six months' time.

Valparaiso, Ind., Water Company Compelled to Show Its Books.

The Valparaiso, Ind., Water Works company has been ordered by the courts to open its books to the city in order that the cost of the plant, cost of renewals and extensions, the operating expenses and the amount received for water consumption during the last five years may be ascertained. The city and company have been having trouble over the agreement existing between the two.

The Cedar Rapids, Ia., Water Trouble.

The Cedar Rapids, Ia., Water company has won again in its contentions with the city about the payment for water for certain purposes. The franchise of the company expired in February, 1900. Under that franchise certain privileges were granted the city as to the amount of free water it was to use. The city held that the occupancy of the streets by the company after the expiration of the contract continued the conditions of that contract. Judge Thompson has ruled that the city must pay a reasonable amount for the water it used. Cedar Rapids may put in a water plant of its own.

Municipal Water Works Prohibited in Ottumwa, Ia., by Decision of Court.

The case of the City Water Supply company of Ottumwa, Ia., against the city of Ottumwa has been decided in favor of the water company and under the decision Ottumwa will not be permitted to establish a municipal water works system. Ottumwa proposed to hold a special election for the purpose of voting on owning its own plant, and the water company already in existence filed an injunction suit in the federal court at Keokuk, asking that the city be restrained from carrying out the proposal, on the ground that the city would thereby contract an illegal debt of about $400,000, and that the city's indebtedness would be in excess of that permitted by law. Judge McPherson granted the injunction and the city officers are enjoined from issuing any bonds or doing any act under or pursuant to a contract entered into with a construction company last spring for the construction of the proposed water plant. The present indebtedness of Ottumwa is slightly above the limit set by law.

Judge McPherson in his decision considers the complaining water company only as a taxpayer and for that reason as having the right to test the validity of any act of the city authorities. The city passed an ordinance electing to build or purchase a water works system and to levy a two-mill tax annually till the plant is paid for, and a five-mill tax, with rental from consumers, to be used for expenses, the excess to form a sinking fund. The ordinance also provided for issuing and paying bonds for the cost of the plant which was estimated to be $318,262. The people at the election were to vote for or against carrying out this proposition. The court said it did not have the right to interfere with the election, but that it could and ought to take cognizance of the proposal to increase the city's indebtedness. The argument that the case is a necessity does not justify Ottumwa in attempting to evade a plain provision of the state constitution in regard to the limit of municipal indebtedness. Other similar Iowa cases were cited, and, according to the court, they all sustain the decision.

The case will probably be carried to the United States court of appeals in St. Louis. There seems to be a decided public sentiment in Ottumwa in favor of the improvement.

Pennsylvania Decision Denies Right of City to Establish Water Rates.

The right of the city of Scranton, Pa., to establish water rates and compel water companies to abide by them is denied by Judge Edwards of the Lackawanna county courts in an opinion in the action of Conrad Schroeder against the Scranton gas and water company. In this case the consumer refused to pay the bills rendered by the water company, but tendered payment of a sum equal to that which could be properly charged if the bill was made out in accordance with the rates established by an ordinance recently passed by city councils. The court holds that it is not within the power of councils to act in such matters. Consumer may appeal to the courts for redress for what he considers extortionate rates.

More Water Needed in New York.

Commissioner Dalton of the New York City water suppply, in his annual report for 1900, recommends that $70,000,000 should be spent within the next seven years to perfect and increase the water facilities of the metropolis. The question of supplying New York with sufficient water is always a pressing one, as the growth of the city and the consequent enlarged demand arising therefrom keep up with all the improvements and expansion of equipment. No immediate water famine is threatened, but the necessity remains for early action in the matter.

Concerning the need of a larger water supply, Commissioner Dalton says in part:

For works of the character and magnitude of those required for the water service of Greater New York five years is the minimum of time consumed from the initial

steps to actual completion. There is immediate need of an increase of 250,000,000 gallons to the daily supply as quickly as it can be secured, and within the next seven years the increase of supply should be 500,000,000 gallons. The selection of new sources and plans for new works should, therefore, be made on a scale to admit of gradual development and expansion, and the ultimate result of adding 500,000,000 gallons per day to our present water supply.

One unusual and unexplained fact is noted in the report, viz.: that the average consumption of water for 1900 shows an increase of only 2,375,000 gallons per day over that for 1899, whereas the increase in 1899 over 1898 was 30,000,000 gallons per day. In the preceding years the yearly increase ranged from 15,000,000 to 25,000,000 per day.

Double Water Service Must Be Paid for by Consumer.

A consumer must pay for double water service, according to a decision handed down by a New Castle, Pa., court. In the water contracts in New Castle a minimum rate is established and the court has held that if there is a double water service through the same meter a rate equal to twice the minimum meter rate may be charged. The case was brought by the owner of a double tenement house who supplied both his tenants through the same meter. When the water company charged him a double rate he entered suit, backed by the city. The court dismissed the bill at the cost of the plaintiff, holding that while there was a single avenue of supply there was double service. An exception was noted for the plaintiff and the city, which had been wanting a test made of the matter, may carry the case to a higher court.

A New York Decision on Water Privileges of Cities.

The owner of a mill and mill race cannot recover damages from a city for diminishing the amount of water in a small tributary of a stream, according to a decision handed down by Judge Houghton of Saratoga County, New York. The owner of a water power on the Sacandaga river at Conklingville sued the city of Gloversville for $25,000 damages because the municipality took water from Mayfield creek, a tributary of the Sacandaga. The case was dismissed on its merits and judgment was directed against the plaintiff for costs. The decision will shut off a number of other actions that were contemplated.

Gloversville has constructed reservoirs and intakes on Mayfield creek at a distance of thirty-two miles from the water power in question. The evidence showed that the flow of the Sacandaga river was diminished somewhat, but not enough materially to damage the plaintiff had he used due diligence in caring for his property. In addition the court stated that in a case of this kind if damages of this kind could lie against the defendant there would be endless litigations between riparian owners of property. The plaintiff did not have rights in the use of the stream to the exclusion of all others. The decision was a lengthy and sweeping one and makes still clearer the rights of those who dwell along and use streams.

Municipal Control of Gas Supply in Washington.

The pressure, illuminating power and purity of the gas used in the District of Columbia are tested at four laboratories, the central, the southeast, the northwest and the Georgetown. S. Calvert Ford, the United States inspector of gas and meters for the district, has made his yearly report to the district commissioners and in it he gives full details as to the qualities and the manner of supplying gas to the customers. The report states that better gas was furnished in Georgetown than in Washington. The highest mean illuminating power was registered in Georgetown and the average was 27.89 in sperm candles. The second best average was 26.44 candles at the southwest laboratory. The northwest laboratory showed 26.14 candles and the central, 25.48 candles. The law requires an average of 25 candles. In January, 1901, an order of the commissioners changed slightly the method of making reports on defaults of the gas company. Every failure to reach the twenty-five candle power, required by law, is now reported. The Washington company was in default thirty times during the year and the Georgetown company nine times. Sulphuretted hydrogen was found in Washington two times and in Georgetown not at all.

The Georgetown station and the southeast station have furnished a superior quality of gas during the year by using the method adopted by R. L. Middleton, superintendent of the Georgetown company. The method is to make the gas from coal and enrich it with a smaller per cent. of naptha than has been used. Inspector Ford recommends that the companies be required to make more suitable rebates when the meters register in excess of the amount used.

Increased Trolley Taxation in Trenton, N. J.

The board of assessors of Trenton, N. J., has increased by $600,000 the assessments of the corporations using the public streets. About one-half of this sum is assessed against the trolley companies. The increases were made by placing a value on the rights-of-way used by the corporations. A recent decision of the New Jersey supreme court regulates the matter.

Letting of New Electric Light Contract in Indianapolis Indefinitely Postponed.

All action upon the proposition to let the contract for electric lighting for the streets of Indianapolis was rescinded by the board of public works on Aug. 17, two days before bids were to be received. The present contract does not expire for about two years. In its statement giving the reasons for this action the board says that the specifications were prepared by experts and were modified in some respects at the request of the present contractor for light who has prevented the reception of bids once by securing an injunction. It continues as follows:

Since their adoption there has been an effort made to make political capital out of the matter by falsely charging the board with trying to favor one company.

The best interests of the city require that the contract for electric lighting should be let free from political bias or prejudice, and the sole object of the board has been to let a contract whereby the city might secure better electric lighting service at a reduced cost. But since, for political purposes, the false charge of favoritism has been made, the board has deemed it to be for the best interest of the city to postpone the letting of the contract until after the city election, thus removing it, as far as possible, from political prejudice and so that the next administration can take up the matter free from the charge of political favoritism.

An Official Who Secures Results.

Commissioner Moreland, member and president of the board of public works in Detroit, Mich., from 1896 to 1900, has been appointed superintendent of public works in the same city. The Michigan legislature last May abandoned the old three-headed board and substituted therefor a one-man administration, and Mr. Moreland is in charge. As soon as he was made a commissioner in 1896 he went to work to revolutionize the system of keeping Detroit clean. He inaugurated the "White Wing" work in Detroit, had "Don't Spit" signs put up over the business part of the city, substituted vitrified brick for repaving alleys in place of cobble stones and pushed along improvements generally till Detroit has come to be one of the best kept cities in this country. It is probable that he has done more to disseminate the gospel of cleanliness in Detroit than any other one man and his reputation has extended to other cities and over the nation till he has come to be called "the Waring of the West," a title that in itself tells a whole story of energy, indomitable will and suggestive brain. With the putting of Mr. Moreland in sole charge of the public works of Detroit the department has taken on new life and even greater things are expected in the future.

City Clerk Brett of Bangor, Me., Presented with Silver Serive.

City Clerk Victor Brett of Bangor, Me., in August completed twenty-five years of continuous service in the office that he now holds. After the regular meeting of the city council on the night of Aug. 13 the two divisions of the council met in joint session and Mayor Chapin, with a happy speech, presented to Mr. Brett a silver service, the gift of the councilmen and other city officials. Mr. Brett responded and thanked the donors in a heartfelt manner for their remembrance on the occasion of his completing twenty-five years of active service for the city. Mr. Brett's term of office has already been one of unusual length.

Technical Meetings.

The twentieth annual meeting of the American Street Railway association will be held in Madison Square garden, New York City, Oct. 9, 10 and 11. T. C. Pennington, sec'y, Chicago, Ill.

The second regular meeting of the Roentgen society of the United States will be held at the University of Buffalo, Buffalo, N. Y., Sept. 10 and 11. Dr. J. Rudis-Jiconsky, sec'y, Grand Rapids, Mich.

The sixth annual convention of the International association of municipal electricians will be held at Niagara Falls, N. Y., Sept. 2, 3 and 4.

The Ontario Municipal association will meet in St. Catherines, Sept. 14.

The annual convention of the association of Edison illuminating companies will be held in Buffalo Sept. 10, 11 and 12.

The annual meeting of the American Institute of Electrical Engineers was held in New York City Aug. 14 to 20, inclusive.

An international good roads congress will be held in Buffalo Sept. 16-21. A portion of the time will be devoted to demonstrations of the scientific methods of modern road construction by building sections of roads using earth, oil, gravel, stone, tarmacadam, vitrified brick, etc. A train equipped with modern road-making machinery will be on exhibition. Addresses will be made by prominent statesmen and officials, engineers and road experts. R. W. Richardson, secretary of the National Good Roads association, Chicago, can give all detailed information desired.

The American Public Health association holds its twenty-ninth annual meeting at the armory of the Seventy-fourth regiment in Buffalo Sept. 16-20. Among the twenty-two subjects for discussion several are of special interest to our readers, including

the pollution of water supplies, the disposal of refuse material, relation of forestry to public health, public health legislation, standard methods of water analysis and variations of the colon bacillus in relation to public health. Dr. C. O. Probst, secretary, Columbus, O.

The American Institute of Architects holds its thirty-third convention at Buffalo Oct. 3-5. Special attention will be given to the study of exposition designs and a number of papers on designing, making, managing expositions and studies of such special features as color and electrical decorative effects are promised.

Indiana Gas Companies Must Obey the Law.

The laws of Indiana do not permit gas companies to charge for more gas than the customer uses. The Martinsville gas, light and fuel company has for several years been charging $1.25 per 1,000 for illuminating gas, and has frequently charged 50 cents per month to consumers when they used as little as 200 feet or less. These consumers have often objected and recently the state prosecuted the company. The case was tried in a justice court and a verdict of $10 fine against the company was returned.

Decisions in Favor of Street Railways in New York and Illinois on Errors in Transfers.

Courts in New York and Illinois have held that "a street railway company is which was not acceptable under the rules of the company, where a mistake in issuing said transfer was made by an employe of the connecting road; there being no community of enterprise between the two companies, and the business of each being independent." The language quoted is from a report concerning the New York case, not liable for ejecting a passenger who presents a transfer from a connecting line, that of Jacobs against the Third Avenue Railroad company. The Illinois case is almost the same. A passenger received a wrong transfer slip and on the connecting line the conductor refused to accept the transfer and the passenger refused to pay her fare. The conductor at first requested the plaintiff to leave the car and then used reasonable force to accomplish ejectment. The Illinois court held that the plaintiff could not recover for any injury sustained, as it was her duty peaceably to leave the car and appeal to the courts.

Electric Railway Company Not Liable for Accident to Telegraph Employe.

The Rhode Island supreme court has ruled in favor of the Narragansett Electric Lighting company in the suit for damages brought against it by the wife of a man who was electrocuted while trying to straighten out a "cross" of wires. The victim was in the employ of the Western Union Telegraph company. The supreme court threw out the case because the evidence did not show that the defendant was negligent in any way.

They Call Them Street Tidies in England.

Among the reforms instituted by the borough councils is an interesting experiment which is being tried by the Kensington council. On every two or three lamp posts is fixed a small receptacle, which is labeled as being for waste paper or refuse. The difficulty will be to induce people to use these street tidies, but if they do use them the condition of the streets will be considerably improved. Bits of dirty paper, orange peel and other casual refuse accumulate rapidly and give the streets a squalid appearance. But if all light refuse is dumped into the lamp-post tidies a sensible improvement will have been effected.—Municipal Journal.

Mosquitoes and Malaria.

During the twenty years since Dr. Laverau, a French surgeon, discovered that the mosquito is at least partly responsible for the existence of malaria much attention has been given to investigation along the lines of the extent of the activities of mosquitoes as malarial agents and of the prevention of this widespread disease. It is only within the last two years, however, that the greatest advances have been made in this field of medical research. At the last meeting of the National Biological society Dr. C. W. Stiles of the Department of Agriculture read a paper in which he contended that the mosquito is the one evil doer in causing malaria.

Dr. Leverau, who is now engaged at the Pasteur institute, Paris, discovered in the blood a microscopic organism which has been recognized as animal. Three species are known, each of which, according to its life cycle, causes a distinct variety of malaria. The life history of the malaria parasite which is found in a certain variety of mosquitoes is exceedingly complicated and contradicts, according to Dr. Stiles, many popular notions, and, he continues, there is no ground for skepticism. People generally believe that night air and swamps cause malaria, as well as the drinking of impure water, but it is asserted that when the whole truth is known it will be readily admitted that the mosquitoes of the genus Anopheles transmit the fever to mankind. Human beings, mosquitoes of the genus Anopheles and malaria germs are necessary to a case of malaria. The first two may exist in the same locality without the presence of the third. The facts that mosquitoes inhabit swamps and fly at night ex-

plain some of the popular ideas about the origin of malarial ailments.

The testimony of Dr. L. O. Howard, the entomologist of the department of agriculture, is that in certain districts malaria has been stamped out practically by killing the mosquitoes, and he thinks that boards of health and municipal authorities will be forced to take up the question. Pouring kerosene on the stagnant water where mosquitoes breed or introducing minnows into the water for the purpose of eating the mosquito larvae, will rapidly exterminate the pests. Dr. Howard says the dangerous mosquito may be detected at night by the fact that his song is about four tones lower than that of the ordinary mosquito.

A New Plan for Street Improvement Assessments in Oak Park, Ill.

A plan that is expected to simplify special assessments for street improvements has been formulated by the Oak Park Improvement Association of Chicago, Ill. The plan makes it possible to levy one special assessment for a series or system of streets. When a street is to be improved the streets leading to it can be included, provided that the necessary amount of frontage can be secured on the petition for the improvement. The promoters of this plan hope thereby to avoid the mistake of improving a street and not having it connected with other paved streets. Oak Park has well-paved streets that are said to be almost useless because they are not connected with other paved thoroughfares. An investigation of the town charter is being made, and if its provisions will permit the plan will probably be adopted. Such a plan is often adopted for sewer assessments, but the laws regarding street assessments in most states are not formed to permit the extension desired. In Indiana, for example, the length of street that can be constructed under one contract and assessment is limited not only to one street, but to the part of the street on which the pavement is of uniform width.

Eight Hours Illegal in Galesburg, Ill.

The city council of Galesburg, Ill., some time ago passed an ordinance requiring all municipal contracts to be let on the basis of an eight-hour day for laborers. The city attorney has declared that the ordinance is illegal.

Charlestown, Ind., Compelled to Build a Sewer.

The town board of Charlestown, Ind., has been put to the expense of building a costly sewer by reason of a recent decision of the state supreme court. Two years ago a resident built a stone wall across the bed of a periodical waterway, which caused the water to stand to the depth of two feet at times in front of residence property. The town board brought suit to have the wall removed, but the supreme court, in deciding the case, held that the stream was not a natural waterway. The sewer had to be built as a consequence.

Gas Companies at War in Toledo, O.

Two gas companies, one artificial and the other natural, supply Toledo, O., and the companies are at war with each other, the natural gas people desiring to buy and combine the interests but being unable to purchase because the artificial gas company's property is rated as being very profitable. The chemist of the pure food commission was asked to make an analysis of the artificial gas being furnished to residents of the city. The analysis was made, and the figures were greatly to the credit of the natural gas. The results of the investigation were printed in the papers, and at once the artificial gas people conducted an analysis of their own. They denied that the city's chemist had the apparatus to conduct the analysis, and unqualifiedly stated that his conclusions were wrong. The figures are widely at variance with each other. The general public which is not especially well posted along chemical lines is not much wiser than before.

The figures compiled by the chemist of the artificial gas company are given below:

	Street Gas. P. Ct.	Coal Gas. P. Ct.	Water Gas. P. Ct.
Light vapors	1.29	.763	4.675
Carbonic acid	1.68	.763	4.025
Heavy hydrocarbons	5.05	1.781	12.467
Oxygen	5.05	1.526	.779
Carbon monoxide	10.36	7.124	21.688
Methane	32.25	27.408	24.155
Hydrogen	45.12	58.139	27.623
Nitrogen	4.25	2.496	4.588
	100.00	100.00	100.00

The results of the investigations of the natural gas chemist are shown in the succeeding figures. A comparison of the street gas column of the first table with the artificial gas column of the second table gives an idea of the variation.

—Artificial Gas—

	Per Cent.
Carbon dioxide	5.2
Heavy hydrocarbons	13.1
Oxygen	.4
Carbon monoxide	18.1
Methane	24.5
Hydrogen	18.6
Nitrogen	20.1

—Natural Gas—

	Per Cent.
Methane	94.1
Nitrogen	5.9

Personal Notes.

R. L. Parker has been appointed city engineer at Niles, Mich.

H. A. Rowland has been appointed city engineer at McPherson, Kan.

David E. Hill, manufacturer of sewer pipe, died Aug. 5, at Akron, O.

Philip H. Weber has been re-elected city engineer for a two-year term, at Canton, O.

Samuel A. Buchanan, of Kenton, O., has been elected city engineer of Bellefontaine, O.

William Franklin Elliot, ex-mayor of Lock Haven, Pa., died Aug. 4, aged fifty-eight years.

Coburn P. Culler of Interlaken, Mich., has been appointed county surveyor of Grand Traverse county.

William H. Laing, superintendent of the Racine water company, Racine, Wis., died Aug. 8, aged fifty-eight years.

Capt. W. O. Douglas, patentee of the Douglas parabolic elliptical truss bridge, died at Binghamton, N. Y., Aug. 16.

B. C. Bratt has been elected city engineer, at Portsmouth, O., to succeed R. A. Bryan, whose term of office had expired.

Jerry O'Shaughnessy has been appointed superintendent of water works at Columbus, O., to succeed Harvey Cockell, resigned.

Cecil B. Smith, recent assistant city engineer of Toronto, Ont., has been appointed resident engineer of the Canadian Niagara power company.

James Ross Kerr, superintendent of the street railway at Kingston, Jamaica, died in Montreal, Que., Aug. 4, of heart failure, aged thirty-eight years.

Messrs. Jenkins and Price were appointed borough engineers at Perth Amboy, N. J., Aug. 13, to fill the vacancy caused by the death of Henry M. Thomas.

Erasmus D. Locke has been elected chief engineer of the water-works pumping plant, Toledo, O., to succeed Dr. Caddy Markley, resigned.

Walter M. Hill, M. Am. Soc. C. E., Grangerville, Idaho, has been appointed chief engineer of the proposed electric road from Grangerville to Lewiston, eighty miles.

Charles A. Cregin, C. E., in the employ of Michael J. Dady of Brooklyn, N. Y., committed suicide Aug. 9, at the Hotel St. George, New York City, by shooting himself.

Harry Vannatta, city engineer at Nelsonville, O., while attempting to assist a workman from a sewer Aug. 24 was overcome by gas and was dead when brought to the surface.

Winter L. Wilson has been appointed assistant professor of civil engineering and Douglas S. Anderson associate professor of electrical engineering at Tulane university, New Orleans.

Prof. Gustave Gillon of the University of Louvain, Belgium, is studying electric traction and the electric transmission of power in the United States on behalf of the Belgian government.

Morris Knowles, Assoc. M. Am. Soc. C. E., has been appointed engineer in charge of the water filtration work, at Pittsburg, Pa., to succeed William F. Miller, resigned.

William F. Miller has been appointed assistant road engineer of Allegheny county, Pennsylvania. Mr. Miller was, until recently, in charge of the water filtration work at Pittsburg.

William P. Carter, electrician of the General Electric company, has been appointed chief of the central pumping station of the water works of New Orleans, La., succeeding John L. Walker, resigned.

Irvine Watson has resigned his position as city engineer at Traverse City, Mich., to take charge of the construction of the intercepting sewer and septic tank disposal system at Fond du Lac, Wis.

John Gadsden, jr., has been appointed engineer of sewerage at Charleston, S. C., to succeed R. B. Olney, who resigned to accept a position with the American Pipe company of Philadelphia, Pa.

Byron I. Cook, Woonsocket, R. I., has resigned his position as superintendent of the water works, which he has held for twelve years, to become inspector for one of the factory insurance corporations.

George H. Gibson, Assoc. M. Am. Soc. E. E., has resigned as assistant editor of Engineering News to accept a position in the Westinghouse company's publication department at East Pittsburg, Pa.

Clark S. Rigby has resigned as city engineer of Benton Harbor, Mich., to accept a position as chief engineer of the West Michigan Traction company, which will build a railroad tunnel under Benton Harbor.

Richard Emory has resigned as superintendent and general manager of the Nashville railway and Cumberland electric light and power company, to accept a position with the street railway and electric system at Milwaukee, Wis.

G. V. Flynn has severed his connection with the New York office of the Westinghouse Electric and Manufacturing company to enter into partnership with J. H. Riley, jr., as electrical contractors, with offices at 72 Trinity-place, New York. The firm name will be G. V. Flynn & Co.

William J. Affleck of Sandusky, O., secretary of the water works board of that place from 1888 to 1897, was recently sentenced to two years in the penitentiary for the embezzlement of between $12,000 and $13,000 while in office. Affleck stood high in business and Masonic circles. He is sixty years old.

K. K. Barsoff, manager of the water distribution of Moscow, Russia, V. V. Oldenberger, a manufacturer of water works machinery of Moscow, and Paul Kilduchesky, an electrical engineer of New York City, are visiting the cities of the United States, under instructions from the municipal government of Moscow, to investigate water systems and to report a plan for the enlargement of the Moscow water system.

THE INDIANAPOLIS CONVENTION OF THE INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.

The International Association of Fire Engineers met in its twenty-ninth annual convention in Indianapolis Aug. 26 to 30. Between two and three hundred members and visitors registered during the five days and there was a large number of exhibitors of fire fighting appliances. The attendance was confined almost entirely to the chiefs and fire fighters from this country, as the roll call at the beginning of the first session did not bring responses from any of the foreign members. Communications were read from a number of chiefs in Canada and England,

CHIEF W. S. HUMPHREY PITTSBURG, PA., PRESIDENT.

and from one in New Zealand. All sent the heartiest greetings and the sincerest wishes for a profitable meeting. A prominent feature of the convention was the presence of a number of representatives of the families of members of the association. Special arrangements were made for the entertainment of the ladies in the shape of carriage rides and trips to the places of interest about the city.

The delegates began arriving on Monday, Aug. 26. Most of the early arrivals were from the East, a large number of them taking advantage of the opportunity offered to stop at Buffalo either going or coming. There were no business sessions on Monday, as the day was given up to registering delegates and arranging the preliminaries to the convention. In the evening a reception was given to the ladies in the parlors of the Grand hotel, the headquarters of the association while in Indianapolis. The Grand hotel is the property of Thomas Taggart, mayor of Indianapolis and a democratic politician of national prominence. Mayor Taggart helped to extend the hospitalities of the city to the visitors. At 10:30 o'clock Monday night the visitors were entertained by the local Elks' lodge, a vaudeville program being furnished by members of Al G. Field's minstrel troupe.

The first business session was held Tuesday forenoon at 11 o'clock. The session was preceded by a short parade which formed at the Grand hotel and marched through a part of the business district to Masonic hall, where the meetings were held. A platoon of Indianapolis police, twenty-eight captains of the Indianapolis fire department, all the living ex-chiefs, the visiting fire chiefs, members of the committees, the board of public safety and the visiting ladies, fifty in number, made up the list of those marching. Chief Humphreys of Pittsburg, president of the association, called the meeting to order and introduced Mayor Taggart, who made a short and hearty address of welcome, to which President Humphreys responded. Following this the chair appointed two committees, one on exhibits, composed of T. P. Quigley, G. M. Kellogg, W. E. Roberts, A. J. Harris and G. W. Miller, and one on credentials, with Jas. Devine, B. J. McConnell, W. G. Butler, S. S. Elforth and A. G. Waldon as members. The association adjourned till the afternoon and went to the Soldiers' and Sailors' Monument, where a picture was taken of all the visitors.

The session of Tuesday afternoon was one of the liveliest in the history of the association. The topics up for discussion were: "The danger to life attending firemen when at work fighting fires by electric light and trolley wires. What is the remedy and how can it be enforced?" Morris W. Mead, superintendent bureau of electricity, Pittsburg, Pa.; "Cisterns as water supply as compared with hydrants," D. J. Swenie, ex-chief fire marshal, Chicago, Ill.; "Does the present method as practiced by [illegible] chiefs

in fighting fires unnecessarily increase losses by water? If so, what is the remedy?" J. D. Paige, chief fire marshal, Joliet, Ill.; "The necessity of regular inspection of buildings, automatic sprinklers, stand-pipes and fire-escapes," Chief B. J. McConnell.

CHIEF C. E. SWINGLEY, ST. LOUIS, MO.
MEMBER OF BOARD OF DIRECTORS

The first paper, by Superintendent Mead, attracted much attention and was considered of so much importance that a committee was appointed to take Mr. Mead's paper, investigate the recommendations made therein and report to the convention for action. The paper will appear in an early number of Municipal Engineering. Ex-chief Swenie of Chicago was one of the most interesting figures of the convention. He is now retired from the head of Chicago's fire fighters, but he is still actively interested in the meetings of the association. His paper on the second topic was listened to with deep interest. He spoke of cisterns as the primitive method of providing means for fighting fires and said that, owing to the occasional inadequacies of the water systems of the present day the cisterns are coming more and more into use. They provide facilities by which engines may secure water with short lines of hose, necessary in districts where there are sky-scrapers. The cisterns can be filled from the hydrants and ought to cost about $147 apiece. This paper was also referred to a committee composed of Chiefs Devine, Salt Lake City, Hughes, Louisville, and Archibald, Cincinnati.

Chief Paige of Joliet, Ill., was not present to read a paper on the third topic, but it was discussed briefly by the convention. Chief McConnell of Buffalo caused the longest and warmest debate of the afternoon when he stated in his paper that in Buffalo the orders of the fire companies are that the first company on the scene of a fire shall attach to the sprinkler system in the building. Some of the chiefs opposed the wisdom of the order and said that much valuable time might be lost thereby. Chief McConnell upheld his position and said that under the conditions in Buffalo such a course is best. The merits of sprinkler systems in general came into the discussion and staid there till the chair brought the meeting up with a round turn to the consideration of the topic of the paper, the necessity for inspection. The tenor of the paper was for a rigid inspection and in this opinion all agreed. At times there was some temper displayed in the discussion of the sprinkler matter, which did not bear directly on the question. The discussion of this paper occupied about three hours.

At the evening meeting Chief J. G. Spencer read his paper on "Driven wells for fire purposes." An abstract of this paper will appear in an early number. The night meeting adjourned after Chief Mayenhoff of Charleston, S. C., had read a paper on

CHIEF JAMES W. DICKINSON, CLEVELAND OHIO.
MEMBER OF BOARD OF DIRECTORS.

the operations of the fire departments in connection with fire insurance matters.

Wednesday was taken up with exhibits and practical tests of appliances. A large room in the rear of the headquarters was set aside for the exhibitors, and also on the parlor floor of the hotel there were rooms given up to models and small apparatus. At 10 o'clock Chief Barrett of Indianapolis gave a display of all the appliances that had been listed for testing. In each case the company making the appliance had direct control of its own apparatus. In the afternoon the fire department gave a run before a large crowd and displayed the working of the department to great advantage. The visitors spent the evening at one of the parks, where special arrangements had been made for entertaining them.

The fourth and fifth days of the convention also contained a mingling of pleasure and business. In the forenoons of both days there were business sessions when matters suggested for discussion at the previous sessions were disposed of, committee reports were listened to and other matters incidental to the closing of the convention were attended to. A business session was also held on Thursday evening. Thursday afternoon the delegates and friends took a trolley ride to Broad Ripple, a river suburb seven miles out, and on Friday afternoon they went in tally-hos and carriages to the plant of the Indianapolis water company and to other points of interest. The last of the delegates left the city by Friday evening, Aug. 31. Taken all around, there was general satisfaction at the reception tendered by the city of Indianapolis and the convention was voted a success.

Municipal Engineering will publish in a later issue the papers for which room could not be made in this issue. This magazine went to press before the convention had fairly ended and some of the matter had to be crowded out this time.

CHIEF H. A. HILLS, WYOMING, OHIO.
SECRETARY.

Those who registered with Secretary Henry A. Hills were as follows:

Alliance, O., Wm. Aungst.
Atlantic City, N. J., Chief Isaac Wiesenthal.
Altoona, Pa., Bert Berkowitz.
Auburn, N. Y., E. J. Jewhurst, John Bell.
Baltimore, Md., G. W. Horton, R. W. Ogden.
Belleville, N. J., Chief P. W. McCoy.
Binghamton, N. Y., Chief C. N. Hoog.
Bloomington, Ind., Chief Samuel Filmore.
Brazil, Ind., John Bray.
Brooklyn, N. Y., J. J. Cashman, jr.

Burlington, Vt., Chief Moses Murray.
Butler, Ind., Chief J. W. Brown.
Butte, Mont., Chief Peter Sanger.
Cambridge, Mass., Chief F. J. Carey, J. M. Carey.
Camden, N. J., S. S. Elfreth.
Canton, O., Chief F. C. Powell.
Cedar Rapids, Ia., J. N. Cooke.
Celina, O., H. Z. Hight.
Central Falls, R. I., Chief J. F. Patt.
Champaign, Ill., Chief John Ely.
Chattanooga, Tenn., Chief H. D. M'Quade.
Chicago, Ill., H. C. Noack, F. C. Grover, D. J. Swenie, T. E. Smith E, J. Herman, W. T. Tate.
Chillicothe, Mo., Chief Val Brockmeyer.
Cincinnati, O., Chief J. A. Archibald, J. P. Ahren, J. M. Rice, F. K. Ludlow, Wm. Fuchs.
Clarksville, Tenn., A. F. Tilley.
Cleveland, O., G. A. Wallace.
Concord, N. H., Chief W. C. Green, G. J. Robinson.
Corsicana, Tex., R. Freedman, M. J. P Lacy.
Crawfordsville, Ind., W. W. Vance.
Dallas, Tex., H. T. Magee.
Dayton, O., M. D. Larkin, A. J. Frorini, D. C. Larkin, T. Lierisch.
Decatur, Ill., Chief C. W. Devore.
Denver, Col., W. E. Roberts.
Detroit, Mich., Chief John Kendall.
Eaton Rapids, Mich., L. A. Bentley.
East St. Louis, Ill., Chief F. B. Bolte.
Elgin, Ill., J. M. Geddes.
Elmira, N. Y., Horace Moore.
Endicott, N. Y., Chief C. F. Johnson.
Escanaba, Mich., Jas. Tolan.
Evansville, Ind., Chief S. R. Carter, Chas. Allenfer, G. P. Stokey, Jos. Meyer, Thos. Coughlin, Wm. Shaffer.
Ft. Worth, Tex., J. H. Maddox.
Grand Rapids, Mich., Henry Lemoin.
Greenfield, Mass., Chief Philip Partenheimer.
Greenfield, O., T. F. Browder.
Harrison, N. J., Chief Thos. Callahan.
Hartford, Conn., H. J. Eaton.
Indianapolis, Ind., Chief T. F. Barrett, Chas. Kahlo, W. C. Long.
Ithaca, N. Y., Chief J. A. Sullivan.
Jackson, Mich., Chief B. F. King.
Jamestown, N. Y., Chief F. H. Wilson.
Janesville, Wis., Chief J. C. Spencer.
Jersey City, N. J., John Brennan.
Kalamazoo, Mich., D. J. Healey.
Kansas City, Kas., Chief Jerry Grindrod.
Lafayette, Ind., W. H. Willoughby.
Lake City, Fla., Chief G. O. Addicks.
Larchmont, N. Y., Chief M. W. Bronson.
Lima, O., Chief Bert Coates.
Long Branch, N. J., Chief J. H. A. Petz, Thomas Bagley.
Lowell, Mass., Chief E. F. Hosmer.
Lynchburg, Va., Chief W. L. Sandage.
Macon, Ga, Chief L. N. Jones, W. T. Bragg.
Mankato, Minn., Chief A. D. Beach.
Memphis, Tenn., Chief W. F. Carroll, M. P. Conroy.
Milwaukee, Wis., Chief Jas. Foley.
Minneapolis, Minn., Chief J. R. Canterbury
Mobile, Ala., Chief Mat Sloan.
Montgomery, Ala., J. F. Browder.
Morristown, N. J., J. B. Stevens.
Muncie, Ind., Chief J. E. Carey.
Newark, N. J., Chief Robt. Austed, J. W. Davis, H. H. Brown, David Benedict, Wm. Exall, F. W. Ross.
Newark, O., Chief Lewis Bausch.
New Britain, Conn., Chief J. J. Palmer.
New Brunswick, N. J., Chief C. M. Banks, Wm. Durham, Jr.
Newburg, N. Y., Wm. Nixon.
New Haven, Conn., Chief Rufus Fancher.
New Orleans, La., Supt. P. T. Burke, Thos. O'Connor.
Newport, R. I., Chief A. K. Kerwin.
New Rochelle, N. Y., Chief Jas. Ross.
New York City, Chief E. F. Croker, J. C. Ryan, J. H. Graham, J. B. Markly, P. L. Wilbur, F. W. Shepard, W. H. Kerwin, F. S. Peace, L. F. Newhouse, F. E. Cummings, M. H. Hart, A. H. Spear, W. E. Powers, W. M. Schwenker.
Niagara Falls, N. Y., Chief O. F. Utz.
Noblesville, Ind., Elwood Wilson.
Norfolk, Va., Chief M. J. Ryan.
Norristown, Pa., S. S. Smith.
North Adams, Mass., Chief W. W. Byers.
Northampton, Mass., Chief F. E. Chase.
Oneida, N. Y., L. E. Meader.
Orange, N. J., J. W. Hodgkinson, H. G. Wilbur.
Oswego, N. Y., R. G. Blackburn.
Paterson, N. J., Chief John Stagg.
Pawtucket, R. I., L. F. Butler.
Pekin, Ill., Chief J. F. Jaecker.
Peoria, Ill., Chief Carl Moeller.
Petersburg, Va., E. B. Farley.
Philadelphia, Pa., W. H. Johnson, Herbert Heston, Bernard Bosch, Wm. McDevitt.
Pittsburg, Pa., Chief M. S. Humphreys.
Plainfield, N. J., F. O. Doane.
Port Chester, Pa., E. F. Studeville.
Providence, R. I., Chief G. A. Steese, C. H. Swan, E. A. Whittaker.
Redbank, N. J., Chief C. S. Mount.
Richmond, Ind., Chief Jas. Parsons.
Richmond, Va., Chief W. J. Fuller, D. W. Taylor.
Ridgewood, N. J., Chief D. J. O'Neill.
Roanoke, Va., Chief Jas. McFall, L. E. Lookabill.
Rochester, N. Y., J. A. Weider.
Rome, N. Y., L. Briggs.
Rushville, Ind., Chief S. N. Thompson.
St. Louis, Mo., Chief C. E. Swingley.
St. Paul, Minn., Frank Whitmore.
Salt Lake City, Utah, Chief Jas. Devine.
San Antonio, Tex., W. G. Tobin.
Schnectady, N. Y., Chief H. R. Yates.
Sharon, Pa., Chief C. E. Bundel.
Sherman, Tex., M. W. Chapin.
Shreveport, La., Chris O'Brien.
Somerville, Mass., Chief J. R. Hopkins.
Sioux City, Ia., Chief G. M. Kellogg.
South Bend, Ind., Chief I. W. Sibrel.
South Omaha, Neb., Chief Lew Etter.
Syracuse, N. Y., Chief J. P. Quigley. D. E. Dooling.
Tampa, Fla., Chief A. J. Harris; J. B. Holton.
Terre Haute, Ind., Chief J. T. Daugherty.
Toledo, O., Chief William Mayo. H. R. Meusing, J. S. Green.
Troy, N. Y., Chief Patrick Byron.
Urbana, O., Chief Noah Connor.
Vincennes, Ind., Chief George Fendrich.
Waco, Tex., A. M. Prescott.
Washington, D. C., Chief R. W. Dutton.
Watertown, N. Y., Chief Fred Morrison.

Wichita, Kan., A. G. Walden.
Winona, Minn., Chief W. C. Norton.
Worcester, Mass., H. R. Williamson.
Wyoming, O., H. A. Hills.
Yonkers, N. Y., Chief J. J. Mulcahy.
Youngstown, O., Chief W. H. Loller.

The association re-elected all of the officers who served during the past year, without a dissenting vote. They are: President, Chief Miles S. Humphreys, Pittsburg, Pa.; first vice-president, Chief Hughes, Louisville, Ky.; second vice-president, Chief Stagg, Paterson, N. J.; secretary, Chief H. A. Hills, Wyoming, O.; treasurer, Chief D. C. Larkin, Dayton, O.

New York City was chosen as the meeting place for 1902 after a spirited contest. Pittsburg and Sioux City, Ia., were also strong bidders for the convention. The New York delegation worked hard for the convention and announced that there is already a guarantee fund of $30,000 for entertainment purposes.

CONVENTION OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

The next convention of the American Society of Municipal Improvements will be held at Niagara Falls Oct. 1-4. President Robert E. McMath of St. Louis and Secretary D. L. Fulton of Allegheny, Pa., have prepared an excellent program for the meeting, which should attract all those interested in the improvement of their cities. The conditions of membership are such that there is a place for all such persons, whether municipal officials, engineers, contractors or public-spirited citizens. The discussions are quite as practical as the papers and the annual publication of the society is the most valuable periodical of its kind. It is well worth the membership fee even if the conventions are not attended.

The meetings of the coming session will be held in the auditorium of the Pure Food company at Niagara Falls. The program has plenty of work in it and will also have place for the inspection of the points of interest to the members of the society. A few days before and after the convention can be spent very profitably in seeing Niagara and the Pan-American exposition.

Wooden pavements will have full discussion with papers upon "Recent Experiences With Wood Pavements," by B. T. Wheeler, superintendent of streets, Boston, Mass., and "Wooden Pavements at Home and Abroad," by F. A. Kummer of Boston. George W. Tillson of Brooklyn will discuss "Pavement Guarantees."

Prof. A. N. Talbot of Urbana, Ill., will make the report of the committee on sewerage and sanitation and there will be papers by Prof. F. E. Turneaure, city engineer of Madison, Wis., on "The New Sewage Purification Plant of Madison;" by Prof. Olin H. Laudreth, Schenectady, consulting engineer of the New York State Board of Health, on "State Legislation and Municipal Sanitation;" by M. N. Baker, New York, on "The Water Meter as a Sanitary Agent;" by Marshall O. Leighton, health inspector, Montclair, N. J., on "Engineering Phases of the Work of Municipal Boards of Health," and by Emmett Steece, city engineer of Burlington, Ia., on "The Cost of Sewer Construction."

The report of the committee on taxation and assessment will be presented by August Herrmann, president of the water commission, Cincinnati, O. Mr. Herrmann's reports are always of great value.

The report of the committee on disposition of garbage and city cleaning will be presented by John Jones of Toronto, Ont., and there will also be a paper on "The Utilization of Garbage in the Production of Steam," by Edward B. Ellicott, city electrician, Chicago, Ill.

Nelson P. Lewis of the highway department, Brooklyn, N. Y., will give the report of the committee on review of engineering progress.

The report of the special committee on uniformity in municipal reporting and accounting and on national statistics will be presented by the chairman, Charles Carroll Brown, editor of Municipal Engineering, Indianapolis.

E. C. Lydon, secretary of the park board, Milwaukee, Wis., chairman of the special committee on park development and maintenance, will present a paper on "Management and Control of Public Parks." There will also be a paper on "The Local Park System," by Theodore A. Leisen, Wilmington, Del.

It is understood that the special committee, consisting of A. N. Talbot, A. D. Thompson and W. K. Eldridge, appointed by the president to co-operate with the committee of the National Brick Manufacturers' association in regard to the proper construction and maintenance of brick pavements, has held joint meetings with the committee referred to and will have a valuable report to present. Papers are promised by C. H. Rust, Toronto, Ont., and others.

Enough is here given to guarantee an interesting and profitable session in which every one of our readers will be interested. The many attractions about Niagara Falls at all times, but especially at this time, including low railroad fares, should insure a large attendance, and the value of the proceedings should add largely to the membership among those who cannot attend the convention.

THE LEAGUE OF AMERICAN MUNICIPALITIES AT JAMESTOWN.

The League of American Municipalities was welcomed to Jamestown, N. Y., on the morning of Aug. 21 by Mayor J. E. Johnson in a formal address which was replied to by President J. A. Johnson, mayor of Fargo, N. D. Secretary MacVicar reported thirteen additions to the list of cities holding memberships. A definite report of receipts and expenditures showing $454 excess of receipts is an encouraging evidence of improvement in business methods in the matter of reporting the financial transactions of the society at least. During the day papers were presented by James L. Weeks of Jamestown on "Special Assessments for City Work," by W. S. Crandall of New York on "The Value of Municipal Leagues," by Dr. William Delano of Grand Rapids on "Garbage Disposal" and by M. N. Baker of New York on "The Unsatisfactory Condition of Garbage Disposal in the United States."

After suggesting an ideal of garbage collection Mr. Baker states that the present methods of disposal are unsatisfactory for several reasons, some of which are: that trustworthy records of the quantities of garbage produced from day to day are not kept and cannot well be kept except under city collection; there is no definite knowledge of the composition of the waste and of its variations; thus all estimates of the size of plants and cost of running them are wild guesses. No figures are available regarding the cost and the profits of garbage reduction. When contracts are let there is not sufficient definiteness of specification and the bids received are never reducible to a basis for comparison and the contract is let by favoritism or prejudice and with very insufficient knowledge. Expert engineers are very seldom called in consultation and failures are attributed to anything but the proper cause, the assumption of expert knowledge by laymen. Short-term contracts are a complete bar both to economy and progress. Very few cities, large or small, have any adequate garbage disposal service.

On the 22d the principal papers were by Edward Kibler on "the Proposed Ohio Municipal Code," by Mayor Norman Fox of Morristown, N. J., on "Municipal Restrictions of Vice," by Richard Sylvester on "The Modern Police Force" and by Harry C. Chase upon "Practical Applications of Uniform Accounting."

Mr. Chase notes the difficulties in the way of the application of uniform systems of accounting, which are largely due to the fact that the accounting system in each city has grown up without any expert direction. In many cases the complication is so great and the labor is so overwhelming that the official incumbents cannot undertake it in addition to their regular duties, and the city goes on until some public-spirited official takes advantage of circumstances favorable to the adoption of a system and secures the appointment of the expert assistance necessary to design the new system and set it in running order. The city of Chicago is now having such a system prepared, and it will probably be a model for future efforts in other cities and thus aid in extending the benefits of systems through the country and be a moving cause of greater uniformity in municipal accounts and reports. No two cities can have absolutely uniform headings and items for accounts, cities in different states have different constitutional restrictions, so uniformity in the sense of identical ledger accounts is impossible. The general titles are common to all, such as (1) general government; (2) protection of life, health and property; (3) public charity; (4) public roads; (5) public industries; (6) public education, recreation and art; (7) miscellaneous; (8) public trust funds; (9) taxation; (10) public indebtedness. These may be subdivided; thus the first may have executive accounts, those of the mayor's office; legislative, those of the council, etc. These subdivisions may first be made in the annual reports and the process of producing the figures may develop the forms of accounts necessary to reduce the labor of reporting to a minimum. The division of accounts into ordinary or maintenance accounts and extraordnary or capital accounts is emphasized. The essential differences between commercial and municipal accounts in the matter of treatment of "assets" is clearly explained, and the consequent effect upon the balance sheet. The first step is a complete and satisfactory form for the city comptroller's or auditor's

annual report, giving statements from the citizens' point of view of the benefit derived by the expenditures of appropriations, as well as from the city officials' point of view. Public works and public industries is another distinction made, the former including streets, sewers and other non-producing activities, and the latter water works, lighting plants and other revenue producers. The difference in character of income from the latter industries and from assessments and taxes to pay for the former is clear. Practical applications of these principles have been made or are making to Newton and Boston, Mass.; Providence, R. I.; Rochester, N. Y., and Chicago, Ill.

On the 23d papers were presented by Frank Parsons of Boston on "Self-Government of Cities" and by Lee Merriweather of St. Louis on "Public Ownership of Utilities." The latter paper will be presented in our pages later. Other important papers were on "The Cost and Durability of Brick Pavements in Ithaca," by Prof. C. L. Crandall, which has been crowded out this month, but will appear later; and on "The Development of Bituminous Pavements," by Fred J. Warren of Boston, which will be found elsewhere in this number. The convention adjourned after an address by Samuel M. Jones of Toledo on "Political Liberty."

The officers elected are: Mayor Charles Ashley, New Bedford, Mass., president; Mayor J. A. Smith, Charleston, S. C., Mayor Richard J. Barr, Joliet, Ill., Mayor James M. Head, Nashville, Tenn., vice-presidents; John MacVicar, Des Moines, Ia., secretary; Mayor Thomas P. Taylor, Bridgeport, Conn., treasurer; Mayor Thomas G. Hays, Baltimore, Md., Mayor John Arbuthnot, Winnipeg, Man., Mayor Harbison, Hartford, Conn., N. S. Parkhurst, Gloversville, N. Y., and P. H. Cummings, Fargo, N. D., trustees. The next meeting will be held at Grand Rapids, Mich.

MACHINERY AND TRADE.

A Long Time Test of Cement.

Visitors to the Pan-American exposition should visit the Buffalo City and County hall where a thirty-year test of Akron Star cement is on exhibition. The erection of this building was begun in 1871 and was completed at a cost of $1,500,000. The hight of the tower is 195 feet. Akron Star cement was used throughout in the construction of this building and it is in perfect condtion today. This cement was on the market before the age of steam railways and a quarter of a century before Portland cement was introduced into this country.

Visitors to the exposition should inspect the cement exhibit in the Ordnance building and a floor laid with Akron Star cement.

An abandoned cement mine of the Union Akron Cement company at Akron, N. Y., has been leased for the purpose of cultivating mushrooms.

The mine is some distance from the surface of the ground and has an even temperature of 50 degrees F. throughout the year.

It is specially adapted to mushroom culture and this valuable product is largely shipped to the New York market.

About Bituminous Macadam.

A handsome illustrated pamplet descriptive of the bituminous pavements laid by the Warren Brothers company, 143 Federal-st., Boston, Mass., has just been issued from the press of Municipal Engineering company. It compares Warren's bituminous macadam water proof pavement with macadam, with tar macadam and with the modern asphalt pavement, and reprints some articles upon the subject which first appeared in Municipal Engineering. There are many illustrations of pavements and walks laid with the materials described and of apparatus used in preparing materials for laying. To those interested in this class of pavement, which is rapidly increasing in popularity, the book will be of much value. Although the Warren Brothers are well known the pamphlet contains a number of letters regarding the members of the firm, their high qualifications and great experience in this kind of work.

Paving Brick in Massachusetts.

J. D. Curtis & Son, brick manufacturers, have just begun the manufacture of vitrified brick at their Hampden-st. brick yards, in Chicopee, Mass. Their new down draft kiln for this purpose has just been put in operation. The brick work arch in which these brick are burned stands about 15 ft. in hight and is 66x30 ft. on the ground. There are six chimneys and the kiln is so arranged that all the heat is utilized. The kiln contains 200,000 brick. Wood fires are used for the first twenty-four hours for drying out and soft coal and cinders for the finish. The brick will be about four days in burning and four days longer in cooling

off. It is expected the kiln will be ready to open in about ten days.

This kiln is attracting a great deal of attention as it is the first venture of the kind in this section and the only factory of the kind in New England. The proprietors are old and experienced brick makers. The clay from their yards at Chicopee is believed to possess all the qualities necessary to produce vitrified brick of the best quality.

Trade Publications.

The Greger Manufacturing company, Philadelphia, issues a handsome illustrated catalogue of the line of municipal engineering castings which they manufacture, special attention being called to their noiseless manhole covers, designed for the use of asphalt filling to take the wear of traffic.

The F. C. Austin Manufacturing company of Harvey, Ill., has issued a new catalogue showing the details of the construction of their gyratory crushers and extended to cover the other apparatus needed in a stone-crushing plant, including revolving screens, elevators, travelers, hoists, bin spouts and gates, dump cars and spreading wagons for delivering the stone. Full details of construction and operation are given and a number of plans and cross sections for plants of various capacities. Some photographs of plants in operation are shown. The catalogue is very valuable to any one engaged in the business, without reference to the particular machinery described, and gives very good reasons for the excellent reputation of the product of this company.

Rowe & Rowe of Chicago issue a handbook of timber preservation, giving full descriptions of the Wellhouse zinc-tannin process, the appliances used and the methods of operation, including the preparation and mixing of chemicals and solutions, forming a hand-book for the constructor and operator of such works which should be of great assistance. The book is illustrated with plans of machinery and photographs of the inside and outside of plants in operation owned by railroads.

The Rockwell-Wabash expansion business systems are well shown in a catalogue issued by the Rockwell & Rupel company of Chicago. The unit system of sectional book cases is applied to the various filing cases, sets of drawers, book shelves, pamphlet files and card indexes of offices, and makes it possible to expand the storage system of the office as the business requires, saving first cost and errors in judgment as to future requirements.

The Montreal, Ottawa & Georgian Bay Canal company of Ottawa, Canada, has issued a "Memorandum on the Growth of the Traffic of the Great Lakes and the Proposed Ottawa Ship Navigation," which is a prospectus of the proposed new route from the upper lakes to the ocean on the route indicated by the title of the company. It makes a very good case in favor of this route and would have more effect this side of the lakes if Ontario and Quebec were states in the union.

"The Purification of Sewage by Bacteria," a lecture delivered to the Belfast Natural History and Philosophical society by Arthur J. Martin, Assoc. M. Inst. C. E., and "The Septic Tank Process of Sewage Treatment at Exeter and Yeovil, England," are two interesting articles published by H. D. Wyllie, Plymouth building, Chicago, Ill., who is the agent in North America for the patentees of some of the apparatus described.

Recent Inventions.

672,003. Apr. 16, 1901. Water Filter. Elmore P. Lynn, Cincinnati, O. A casing, a cylindrical filtering medium hollow through its center, and a cleaning device of brush or scraper working around the cylinder.

672,012. Apr. 16, 1901. Registering Apparatus for Use in Connection with Lifting or Hoisting Devices. Wilhelm A. A. Roper, Hamburg, Germany.

672,039. Apr. 16, 1901. Excavator. George W. King, Marion, O. An excavator with downward and outward sloping beam with channels or track, excavating shovel movable endwise of track and excavating toward the machine.

672,164. Apr. 16, 1901. Hose Pipe or Nozzle. Cornelius Callahan, Canton, Mass. A hose pipe provided with a tubular extension, a loose sleeve constituting a hand piece and surrounding said extension, means to restrain sliding of sleeve and anti-friction means to allow rotation within sleeve.

672,175. Apr. 16, 1901. Cement or Concrete Construction. Frederick Melber, Pittsburg, Pa. One or more girders with metal rods embedded on lines of tension strains and others transversely to shearing strains, walls or abutments and brackets on them to take thrust, rods projecting for uniting with other construction.

672,176. Apr. 16, 1901. Cement or Concrete Construction. Frederick Melber, Pittsburg, Pa. A union for abutting cement or concrete shapes, consisting of metal embedded in said shapes along the lines of the tension strains and having its ends protruding from them and overlapping the abutting ends, and a covering of cement fixing the overlapping ends to the shapes.

672,242. April 16, 1901. Heat-Utilizing Garbage Furnace. John C. H. Street, Oakland, Cal.; assignor of one-half to John L. Howard, same place. Horizontal furnace-chamber with feed opening at one end, inclined exit openings in top wall at opposite end, leading to secondary combination chamber over furnace, a boiler chamber over this and a boiler, passage from boiler downward to an exit about the feed funnel for the furnace.

672,319. April 16, 1901. Insulator for Conduit Electric Railways. John M. Eadie, Alexander Stevens, and Romeo P. Tomassek, New York. A line conductor extending along a conduit, a hanger carrying the line conductor at one end and covered with and

held by insulating material at the other.

672,486. April 23, 1901. Settling Reservoir or Basin. Wm. P. Mason, Troy N. Y. A reservoir or settling tank provided with an inner wall on one side, there being a passage between the main and inner walls, a number of partitions extending between the ends of the partitions and the opposite main wall, gates in the inner wall in the space between partitions, removable covers extending between partitions at their tops and means to operate the gate and covers above the water level.

672,614. April 23, 1901. Plant for Disposal of Sewage. Joseph Danner, Scranton, Pa., assignor of one-half to John M. Kemmerer, same place. Has a receiving chamber with porous floor, air inlet opening, drying chamber adjacent and separated by partition with air passage way in upper portion, and valve controlled opening below, a porous floor in drying chamber and air chamber below the floor, a furnace chamber connected with air and drying chamber by proper passageways.

672,822. April 23, 1901. Sidewalk. William L. Caldwell, New York., N. Y., assignor of two-thirds to John W. Rapp and Henry Loy Easton, same place. Metal bent in trough shape above and below with slight outward flare, the upper troughs being filled with cement forming girders and the metal surface between being cut and filled with glass for lights below.

672,868. April 23, 1901. Casing and Cover for Catch Basins. Jas. Banwell, Cleveland, O., assignor to C. W. Nokes and Geo. Caunter, same place. Cover has upwardly projecting walls at its sides and rear and a flat curb portion across front and top.

672,885. April 30, 1901. Surveying instrument. Christian L. Berger, Boston, Mass. A camera surveying instrument.

672,886. April 30, 1901. Equatorial Adapter for Transits. Christian L. Berger, Boston, Mass. Has main and auxiliary telescopes and means of adjustment to proper planes.

672,934. April 30, 1901. Apparatus for Mixing and Placing Material for Concrete Pavement. Chester T. Drake, Chicago, Ill. A mounted mixer and chain-driven carrier capable of lateral swinging movement as a whole, to distribute material as desired.

672,978. April 30, 1901. Opening Mechanism for Mixing Machines. Isaac H. Fisher, Washington, D. C. A rocking or oscillating saddle and an arm connected thereto for opening a mixing drum.

Trade Notes.

ASPHALT.

The plant of the Western Paving & Supply company on Commerce-st., Milwaukee, Wis., was completely destroyed by fire Aug. 16, entailing a loss of about $4,000. The plant will be rebuilt at once.

The Federal Asphalt company, Chicago, Ill., has been incorporated with a capital of $5,000,000. The company's offices will be in the New York Life Building with M. D. Coffee as manager. Gilbert B. Shaw and a number of other prominent capitalists are interested in the company, which has been organized for the purpose of competing for the asphalt paving of the country. The company proposes to use rock asphalt entirely and large mines and quarries have been secured in Kentucky.

An analysis of the substance in the vicinity of Promontory, Utah, has been made by the Standard Oil company, which shows that the samples sent to be tested are 85 per cent. pure asphaltum of the best quality, similar to that used by the Chaldeans over 4,000 years ago in the erection of buildings. More than 20,000 acres in the vicinity show evidence of asphalt, but the extent and depth of the deposit has not yet been ascertained.

The Carter Stone company of Liberal, Mo., has a deposit of asphalt sandstone in which the percentage of asphalt varies from 7 to 18. Close to the quarry is an undeveloped oil spring showing 12 degrees Beaume, moisture 14 per cent., fire test 162 degrees, distilled under 500 degrees F. 24 per cent. asphalt, 22 per cent. fine. They are slowly developing the quarry.

BRICK.

The Sioux City Brick and Tile company, Sioux City, Ia., contemplates building a new plant for the manufacture of paving brick.

F. R. Carter of Peoria, Ill., will install new machinery in his brick plant at Chilton, Wis., and will manufacture paving brick in addition to sidewalk and building brick.

The Terre Haute Brick and Pipe company is building two new kilns at its paving brick and tile plant.

D. F. Stouffer of York, Pa., is interested in the proposed manufacture, in that vicinity, of pressed building brick under the process of the machines patented by Oswald Kutsche of Erie, Pa. The manufacture of terra cotta, tiling, sewer pipe and paving brick under patents of Mr. Kutsche will also be added shortly.

A. W. Weyer & Co. of Cleveland, O., have purchased the Sam Kilderhouse farm, near Hamburg, N. Y., and will erect at once a plant for the manufacture of paving brick.

The Mack Manufacturing company, New Cumberland, O., has purchased the works of the Clearfield Clay Manufacturing company, Clearfield, Pa.

The West Virginia Vitrified Brick company, Chattanooga, Tenn., has purchased the large brick plant at Chilhowie, Va., formerly owned by the Virginia Paving company.

W. B. Lower has purchased the interest of A. L. Stetson in the Sioux Paving Brick company and the Lower Sioux Brick company, Sioux City, Ia., and the latter plant has been placed in operation by Wm. Lower after a year's idleness.

CEMENT.

The St. Louis Portland Cement company, St. Louis, Mo., has been incorporated and a large plant will be erected at once. John C. Robinson, formerly of Sandusky, O., was promoter of the project. The board of directors includes Edward Whitaker, J. C. Van Blarcum, Chas. D. McClure, John Scullin, S. W. Fordyce, E. E. Paramore, F. R. Bissell, Chas. B. Stowe and John C. Robinson. The plant will be erected at Prospect Hill, one mile north of Baden, Mo.

The Amalgamated Cement company, Wellston, O., has been incorporated.

A valuable rock cement has been discovered on the farm of Thomas P. Buchanan, near Saltsville, Va., which has been analyzed and pronounced equal to hydraulic Portland cement.

The Mason Lime and Cement company of Omaha, Neb., has been incorporated with A. T. Lien as president and J. J. Long as secretary.

The Mohawk Cement company, Trenton, N. J., has been incorporated to manufacture cement by J. H. Kugler, Paul W. Ryder and Edward S. Chambless.

A syndicate has purchased 360 acres of cement rock near Nazareth, Pa., and will erect a large cement plant. Jas. W. Skepp, president of the Reading & Southwestern R. R., Reading, Pa., is at the head of the enterprise.

The Martin's Creek Portland Cement company, Martin's Creek, Pa., has executed a mortgage for $100,000 to the Land, Title and Trust company of Philadelphia. The company was formerly known as the William Krause & Son's Cement company and the money secured is for the purpose of liquidating that firm's indebtedness and to improve the plant.

The bondholders and stockholders of the Michigan Cement company, Coldwater, Mich., have decided to reorganize, reducing the capital stock. A committee was appointed composed of the following: E. D. Johnston, Calumet, Mich.; L. M. Wing, H. H. Barlow, Coldwater; R. H. Munson, Bay Mills; A. C. Raymond, Detroit.

The Bellaire Portland Cement company of Bellaire, Mich., has been organized with Dr. Toles as president and C. E. Densmore as secretary. George Reed of Mt. Pleasant and John C. Dooling and Judge S. B. Dabolk of St. Johns, Mich., are interested.

The Quincy Portland cement works, Quincy, Mich., have closed down.

The erection of a $500,000 cement plant at Vancouver, B. C., is proposed by the Pacific Coast Portland Cement company, whose New York offices are at 66 Broadway. The estimated cost for various electrical machinery is between $75,000 and $100,000, all of which is to be purchased in the United States.

The works, grounds, machinery, etc., of the White Cliffs Lime and Portland Cement company, White Cliffs, Ark., were sold recently under an order of the federal court. Eastern capitalists purchased the property for $160,000, and will organize a new company and push the development of the property at once.

Schuyler S. Olds, Lansing, Mich., has been elected president of the Elk Rapids Portland Cement company to succeed O. F. Jordan, resigned. Improvements in machinery, which will increase the output and lessen the cost of manufacture, are contemplated.

The Hecla Cement and Coal company, Bay City, Mich., announced, about Aug. 18, that work on its mammoth plant would begin within twenty days. The company owns 1,000 acres of marl from three to thirty-five feet thick. In addition to the cement plant and electric railway the company will construct a chemical plant, with a daily capacity of fifty tons of potash and alkali; a brick plant with a daily capacity of 50,000 bricks; lime kilns of 1,000 barrels; coke ovens of 300 tons; salt block of 300 barrels. Julius Stroh of Detroit is president.

The Reading Cement company has purchased a large farm from Abraham Heffner at South Evansville, Pa., which contains a deposit of cement rock. Foundations are being erected for mills.

Eastern capitalists will build a cement plant at Nettle Lake, just south of Camden, Mich., where a large deposit of shell marl has been found, according to press reports.

On the application of William H. Stayton, a stockholder, a temporary injunction has been granted against the Northumberland Portland Cement company of Pennsylvania, restraining them from calling a special meeting.

The Equitable Trust company of Chicago has been appointed receiver of the Marquette Cement company. Liabilities, $135,000; assets, $75,000.

The cement works of Thomas Morgan & Co., at Longue Point, near Montreal, Canada, were destroyed by fire recently, entailing a loss of $50,000. The works will be rebuilt at once.

C. Leonard of Los Angeles, Cal., and Aman Moore of Florence, Cal., have purchased 640 acres of state land near Florence, and will build a large cement factory at an estimated cost of about $400,000.

A receiver has been appointed for the Dickinson Cement company of Chicago. The company was incorporated in 1893.

The Washington Litholite Stone company, Washington D. C., has been incorporated to manufacture and sell stone, cement, lime, etc., by J. Wilson Bunn of Lansing, Mich.; T. Franklin Athey and others.

LIGHT, HEAT AND POWER.

The Auburn Light, Heat and Power company, Auburn, N. Y., has been absorbed by the Electric company of America, whose headquarters are in Philadelphia. The new owners took charge Aug. 16. Col. A. Louden Snowden of Philadelphia was elected treasurer; H. T. Hartman, vice-president; Frank A. Ball, Philadelphia, secretary and treasurer. Jas. S. McCabe of Auburn will continue to act as general manager. The company has also acquired possession of the subway rights and franchise granted by the city to John Flanagan of Wilkesbarre, Pa., and will continue the construction of subways now being constructed.

The Beardsley Gravity Dam company of Elkhart, Ind., has secured options on most of the low lands which will be affected by backwater, and will build a series of dams in the Kankakee river between Altorf and the mouth of the river. E. R. Beardsley of Waldron, Ill., is president of the company. Another company is being organized in Chicago to build a series of seven dams and to erect power houses at Altorf and Wilmington from which electrical power will be transmitted to Chicago, and possibly Kankakee. This company will contract with the Beardsley company for the construction of the dams.

Newly Incorporated Companies—Yellville Electric Light and Power company, Yellville, Ark.; Farmersville Electric Light company, Farmersville, Tex.; Consolidated Electric Light, Heat and Power company, Poughkeepsie, N. Y.; Harrison Electric Light and Ice company, Harrison, Ark.

MISCELLANEOUS.

Frederick W. Lamp and William Koedding of St. Louis, Mo., have been granted a patent for an electrolytic water purifier in which there are electrodes of iron, in the form of a series of vertical, closely spaced plates, of which the end members only are connected with the source of current, the intermediate plates functioning as bipolar electrodes. The water to be purified passes upward between these plates from a distributor, and thence under pressure to a settling tank, which it enters tangentially, whereby is imparted to it a swift rotary movement that carries the bulk of the suspended impurities to the periphery. The purer water is withdrawn axially from the tank, passes upward through a filtering bed, still under pressure, to an ingeniously constructed valve in the discharge pipe.

The Stilwell-Bierce & Smith-Vaile company of Dayton, O., has secured an order from the village of Hogate, O., for two Smith-Vaile deep-well pumps and a Smith-Vaile general service pump.

The North American Paving company, Pierre, S. D., has been incorporated by Wm. L. Breyfogle, H. B. Cook and T. P. Estes.

The Onondaga Litholite company, Syracuse, N. Y., has been incorporated to manufacture litholite and artificial Portland stone under the C. W. Stevens patents.

Harvey, Ill. The directors are C. A. Lockard, E. Bravender and Edward A. Kingsbury, all of whom are connected with the Empire Portland cement works at Warner, N. Y.

The Youngstown Garbage company, Youngstown, O., was incorporated July 31 by J. W. Long, S. S. Harman, Thomas L. Morgan, Ed. L. Miller and Thos. J. Milroy.

The stone crushing plant of Legg & Co. at Chesaning, Mich., was destroyed by fire recently.

The National Concrete company has been incorporated in New Jersey by Cleveland V. Childs, Jas. R. Mapletoft and H. N. Smith.

The Carlyle Rock Crushing company, Carlyle, Ill., has been incorporated to deal in crushed stone by A. F. Gross, F. Schlafly and P. Hinkle.

SEWER PIPE.

The National Web Tile Sewer company and the Interlocking Web Tile Sewer company, Syracuse, N. Y., are considering the question of consolidation with a capital stock of $600,000. Formal action on the proposition has been postponed until Sept. 5.

WATER.

Newly incorporated companies: Schoharie Water company, Hunter, N. Y.; Bloomington Water company, Bloomington, Ind.; Lake City Water company, Hammond, Ind.; Evansville Water, Light and Power company, Evansville, Wis.; Breese Water and Improvement company, Breese, Ill.; Carbondale Water-Works company, Carbondale, Ill.; Hamlet Water company, Hoboken, N. J.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Dublin, Ind.—Cement walks are being constructed to replace the brick walks in this city.

Savannah, Ga.—A protest was filed in the United States circuit court Aug. 7 against the validity of the ordinance providing for the paving of Gaston-st. with brick.

Syracuse, N. Y.—The total amount of damages pending against this city this year on account of alleged accidents from defective sidewalks is $104,000, and the number of claims filed is twenty-five.

Chicago, Ill.—President Rogers, Albert Schoenbeck and Ernest McGaffey, members of the board of local improvements, visited Indianapolis recently to inspect the creosoted block paving in that city.

Manitowoc, Wis.—Columbus and Sixteenth-sts. will be improved under the supervision of the street commissioners. The city is to hire its own teams and men. The object of the city is to learn the actual cost of constructing a street.

Baltimore, Md.—The Baltimore county commissioners have decided to expend no more money in improving streets at Highlandtown and Canton, which belong to corporations and individuals, and which have never been dedicated in proper form to the county's use.

Cedar Rapids, Ia.—Asphalt is being used in the paving of Fifth-ave., this summer. It is the purpose of the municipal authorities to make this thoroughfare one of the handsomest in the city, and the use of asphalt, according to newspaper comment, seems to give general public satisfaction.

Cortland, N. Y.—A resolution was adopted Aug. 7 prohibiting the running or propelling of traction engines in and along streets paved with asphalt. The ordinance will take effect at once and the police will be instructed to arrest all violators. The Cortland Traction company, without solicitation on the part of the city, has signified its intention of repairing the damage done to the paving blocks in Main-st. by its heavily-loaded gondola car, which was drawn through the city recently. The flanges on the wheels of the gondola were too wide for the track along the Main-st. pavement and did considerable damage to the paving brick.

CONTEMPLATED WORK.

Duluth, Minn.—Cement walks are proposed for the West End.

Urbana, O.—Bids have been authorized

for improving Miami-st.

Elgin, Ill.—The question of paving Highland-ave. is being agitated.

Morris, Ill.—Brick paving is proposed for Washington-st. Mayor Dawson.

Moline, Ill.—Cement walks on E. Tenth-st. are proposed. Mayor Wessel.

Kewanee, Ill.—An ordinance has been approved providing for new sidewalks.

Boone, Ia.—Brick paving is proposed for Story-st., from Union to Woodland.

Carey, O.—The council has decided to macadamize Clay-st., from Vance to West.

Burlington, Vt.—New bids will be asked for macadam paving in Colchester-ave.

Aurora, Ill.—A petition is being circulated asking for brick paving on Fox-st.

Chagrin Falls, O.—Ordinances have been passed for paving Main-st. with brick.

Bay City, Mich.—Asphalt paving is desired for N. Henry-st., between Midland and S. Union-sts.

Hancock, Mich.—Plans for brick paving will be prepared by S. D. Austin of Milwaukee.

Richmond, Ind.—Plans have been approved for paving N. Eighth-st. Cy. Engr. Weber.

Evansville, Ind.—An ordinance to improve Seventh-st. was favorably acted upon, Aug. 19.

North Branford, Conn.—This town voted to issue $9,000 bonds for road improvements.

East St. Louis, Ill.—A petition is being circulated asking that Cleveland-ave. be paved.

Rockford, Ill.—The construction of about 10 mls. of concrete tar walks is contemplated.

Windsor, Conn.—The question of macadamizing the highways is being considered.

Crookston, Minn.—Mayor Campbell has recommended brick and asphalt for permanent paving.

Sacramento, Cal.—Resolutions have been adopted for macadamizing Ninth-st., from C. to G.

Watertown, N. Y.—The construction of a cement walk around the city hall has been recommended.

Monona, Ia.—The construction of sidewalks on Page and Franklin-sts. has been authorized.

Marietta, O.—The city clerk has been directed to usk for bids for paving High School lane.

Syracuse, N. Y.—Cement walks are proposed on Lincoln-ave., from Tallman-st. to Bellevue-ave.

Kansas City, Mo.—Ordinances were passed Aug. 21 to repair the pavements on a number of streets.

Rochester, Pa.—An ordinance has been passed for macadamizing Madison-st. Howard Bliss, burgess.

Des Moines, Ia.—Grading and graveling was ordered Aug. 19 for University and W. Grand-aves.

Iowa City, Ia.—Ordinances were passed Aug. 2 providing for sixteen blocks of brick paving on College-st.

Bowling Green, Ky.—Bids will be asked for paving Broadway, from Kenton to High. Mayor Townsend.

Washington, Ia.—Objections will be heard Sept. 2 to the proposed brick paving on concrete base on Main-st. H. H. McCleary, cy. clk.

Menasha, Wis.—A petition asking that Church-st. be macadamized is being considered. Mayor Campbell.

Battle Creek, Mich.—A resolution was passed Aug. 12 providing for asphalt block paving on Maple-st.

Bay City, Mich.—Asphalt paving is contemplated for Van Buren-st., from Center-ave. to Ninth-st.

St. Paul, Minn.—The property-owners on S. Wabash-st., from Water to Isabel, are in favor of asphalt paving.

Red Oak, Ia.—A resolution has been passed to pave Coolbaugh-st., from Fourth to Fifth-st. S. E. Moulton, cy. clk.

Dallas, Or.—A resolution was passed Aug. 12 authorizing the construction of certain sidewalks. Mayor Ellis.

Stamford, Conn.—The citizens of this place are formulating a plan for the improvement of the streets.

Mishawaka, Ind.—Cement walks are proposed on Mill-st., between First and Second. M. M. Fisher, mayor.

Denver, Col.—Petitions for asphalt paving on five streets have been submitted to the board of public works.

Sarnia, Ont.—A granolithic walk on Devine-st., from Emma to Christina, is contemplated. J. D. Stewart, town clerk.

Joliet, Ill.—Eastern-ave., from Jackson to Cass, will be paved with asphalt. R. J. Barr, mayor; E. D. Rickson, cy. clk.

Galt, Ont.—The construction of cement walk on E. Main-st., from Shade to Spruce, has been authorized. Clk. McCartney.

New Albany, Ind.—A resolution is pending which provides for the reconstruction of streets with brick or asphalt.

New Brighton, Pa.—The citizens and business men of this city are in favor of paving every street of any importance.

Norwich, N. Y.—Petitions have been submittted to the village trustees asking that N. Broad and Mitchell-sts. be macadamized.

Sumter, S. C.—The committee on paving has been authorized to employ a civil engineer if necessary. A. B. Stuckey, mayor.

Springfield, O.—The city engineer has been directed to make plans and specifications for grading and graveling seven streets.

Galion, O.—A resolution was adopted Aug. 20 declaring it necessary to construct stone sidewalks on a number of streets.

Ft. Wayne, Ind.—Resolutions have been approved for paving Taber-st. and building walks on certain streets. Cy. Engr. Randall.

Blountsville, Tenn.—Action on the question of issuing $100,000 bonds for building macadam roads has been deferred until January, 1902.

Nashville, Tenn.—Bills have been introduced in the city council providing for an expenditure of $88,000 on the thoroughfares of this city.

Bangor, Me.—Ordinances were passed Aug. 13 providing for granite crosswalks on Garland and Montgomery-sts. and repairs on certain streets.

Zionsville, Ind.—Ordinances have been passed and bids will be asked for cement walks on Meridian and Academy-sts. Bert A. Mills, clk.

Paducah, Ky.—Ordinances were passed

Aug. 19 for grading and graveling Fifteenth, Madison, Fourteenth and Harrison-sts. Mayor Lang.

Traverse City, Mich.—The construction of a cement walk on W. Tenth-st., from Wadsworth to Division, has been recommended. O. P. Carver, chm, B. P. W.

Utica, N. Y.—The residents on E. Liberty-st. have petitioned for asphalt paving on concrete. The work will be done this season. Cy. Engr. Capron.

Sheffield, Ala.—An ordinance was passed Aug. 22 providing for the construction of concrete walks on the principal streets of the city.

Jacksonville, Fla.—The city engineer has been instructed to prepare an estimate of the cost of paving Catherine-st., from Bay to Forsythe.

Terre Haute, Ind.—The property-owners on Eighth-st., from the Vandalia R. R. to Lafayette-ave., have petitioned for sidewalks and cement curbs.

Waukegan, Ill.—A number of sidewalk ordinances were passed Aug. 19 and action taken preliminary to asking for bids for sidewalks and crosswalks.

Sioux Falls, S. D.—Resolutions were adopted Aug. 20 providing for the construction of cement walks on Fourth, Ninth and Twelfth-sts. and Main-ave.

Atchison, Kas.—An alley will be paved with brick, requiring the following: Paving, 1,757 sq. yds.; concrete curb, 752 lin. ft.; brick sidewalk, 3,600 sq. ft.

Louisville, Ky.—Ordinances were approved Aug. 10 for asphalt paving on Van Barries, Castlewood and Winter-aves. in the Highlands. Chmn. Grainger, of B. P. W.

Newark, N. J.—Granite paving on sand is proposed on Cutler-st., from Sixth to Seventh. Ordinances have been recommended for paving Pennington and Franklin-sts.

St. Joseph, Mo.—City Engineer Floyd is preparing to draft an ordinance providing for the paving of King Hill-ave., from Division-st. to the southern city limits.

Milwaukee, Wis.—Resolutions were passed Aug. 19 to pave Juneau-ave., from Jackson to Van Buren, with brick, and to improve Twenty-eighth and Twenty-ninth-aves. and S. Pierce-st.

Wichita, Kas.—Resolutions were passed Aug. 19 ordering curbing and guttering on Lawrence and Topeka-aves. and appropriating $200 for the improvement of Linwood park.

Kansas City, Kas.—A petition was presented to the council Aug. 20, asking that Minnesota-ave., from Fourth to Eighth, be paved with Lake asphalt of the Warner-Quinlan brand.

Anaconda, Mont.—Resolutions are pending providing for the paving of Renshaw-ave., from Park to Galena, and for new sidewalks where needed in various parts of the city.

Seattle, Wash.—Plans and specifications were approved Aug. 17 for cement walks on Second and Belmont-aves. and E. Harrison-st. Wooden block paving is proposed for Spring-st., from First to Railroad-ave.

Erie, Pa.—Ordinances were passed Aug. 12 for repaving around Central park with asphalt or brick. Ordinances are pending for paving Sixteenth and Fourth-sts. and repaving French and Peach-sts.

Denver, Col.—Plans have been completed and bids will be asked soon for grading nine miles of streets and for 77,830 lin. ft. of concrete curb and gutter. H. F. Merryweather, asst. engr. dept. pub. wks.

Lake Forest, Ill.—An ordinance was passed Aug. 12 providing for the construction of a cement sidewalk on Western-ave., from Wisconsin to Laurel-ave. Edward F. Groton mayor; Jas. F. King, cy. clk.

Great Falls, Mont.—An ordinance was passed Aug. 12 creating special improvement district No. 14 for grading, curbing, boulevarding and building sidewalks in Fifth-ave., north, at a total cost of $8,610.

Marion, Ill.—Final action will be taken Sept. 2 on the resolution to construct permanent walks in certain streets and avenues, and macadam paving on Seventh-ave., and Tenth, Eleventh and Twelfth-sts. P. M. Plumb, mayor.

Indianapolis, Ind.—Final action has been taken on the proposed brick paving of the first alley north of Thirtieth-st., from Illinois to Capitol-ave., and for cement walks on a number of streets. Albert Sahm, chm. B. P. W.

Albany, N. Y.—An ordinance will be introduced providing for brick paving on Fulton and Van Zandt-sts. An ordinance has been passed to pave Washington-ave., from Perry to Quail-sts. with brick. F. U. Bresler, clk. com. counc.

Alexandria, Va.—The council committee on streets will consider Sept. 16 the matter of grading and paving King-st., from the eastern terminus of the present brick paving to Union-st., with vitrified brick on concrete base.

Topeka, Kas.—The city engineer has been directed to prepare plans for paving the approaches to the Kansas-ave. bridge. Ordinances have been introduced, one providing for twenty-nine blocks of paving and one for sidewalk repairs.

Luverne, Minn.—Petitions are being circulated asking for the construction of cement walks in Warran-st. and Freeman-ave. If the plans now under discussion are carried out more than 50,000 sq. ft. of cement walk will be laid this year.

Winnipeg, Man.—The property-owners on Main-st. desire asphalt paving. King-st., from Point Douglas-ave. to Flora-ave., will be paved with macadam. Granolithic walks will be constructed on Bannatyne-ave. and Princess-st. C. J. Brown, cy. clk.

Litchfield, Ill.—An ordinance was passed Aug. 20 providing for the tax levy for the coming year as follows: General purposes, $5,250; street purposes, $6,000; repairing and maintenance of water works, $1,000; extension and maintenance of sewers, $1,500.

Omaha, Neb.—An ordinance was adopted Aug. 20 for repaving Twenty-fourth-st., from Farnam to St. Mary's-ave. Petitions were received for paving and curbing Dodge-st., from Thirty-eighth-ave. to Fortieth-st., and for repaving Thirty-seventh-st., from Farnam to Leavenworth.

Mingo Junction, O.—Specifications have been prepared for the following improvements: Murdock-ave., extension, 898 sq. yds. of brick paving and 2,018 lin. ft. of curbing; Murdock-ave., 956 sq. yds. of brick paving and 1,190 lin ft. of curb; Ravine st.,

413 sq. yds. of brick paving, 711 lin. ft. of curb, with masonry walls and steps; Church-st., paving sidewalks, 194 sq. yds.; gutters, 84 sq. yds.; curb, 257 lin. ft. Jas. L. Cox, cy. engr.; G. H. Turner, vil. clk.

Washington, D. C.—The district commissioners ordered, Aug. 22, a large amount of work under the provisions of the assessment system. The work includes the construction of cement walks, setting granite curb and paving certain alleys with vitrified or asphalt block.

Conneaut, O.—(Special.)—G. B. Pike, cy. engr., says the special election held Aug 9 to determine the question of issuing bonds was favorable to the following improvements: Paving, $65,000; sewers in districts Nos. 3 and 4, $33,500; electric light improvements, $20,000; city building, $10,000.

Dekalb, Ill.—(Special.)—Walter M. Hay, cy. engr., wrote, Aug. 21, saying that contracts for the construction of 3 miles of brick paving will be let within three weeks. He is also preparing plans and specifications for about one-half mile of brick paving for the northern Illinois State Normal School, the contract for which will be let in about thirty days.

CONTRACTS TO BE LET.

St. Paul, Minn.—Bids are asked until Sept. 15 for asphalt paving in Jackson-st. B. P. W.

St. Paul, Minn.—Bids are asked until Sept. 3 for grading the White Bear Beach road. Co. audt.

Conneaut, O.—Bids are asked until 12 m. Sept. 21 for paving four streets with brick. G. B. Pike, cy. engr.

Bloomfield, Ind.—Bids are asked until Sept. 2 for building a gravel road in Center twp. Harvey L. Doney, co. audt.

Cincinnati, O.—Sealed bids are asked until 12 m. Sept. 7 for repairing Carthage-ave. E. L. Lewis, co. audt.

Youngstown, O.—Bids are asked until Sept. 14 for paving portions of four streets. C. E. Cross, cy. com'r.

Toledo, O.—Bids are asked until Sept. 10 for macadamizing and graveling stone road No. 34. William M. Godfrey, co. audt.

Alliance, O.—Bids are asked until Sept. 14 for improving portions of several streets. J. H. McConnell, cy. clk.

Barberton, O.—Bids are asked until Sept. 9 for paving Tuscarawas and Second-sts., according to press reports.

Elizabeth, N. J.—Bids are asked until Sept. 3 for 5,625 sq. yds. of block paving on Chestnut-st. N. K. Thompson, st. com'r.

Oshkosh, Wis.—Bids are asked until 12 m. Sept. 14 for grading and graveling Jefferson-ave., from Lincoln to Sterling. B. P. W.

Marinette, Wis.—Sealed bids are asked until 12 m. Sept. 17 for paving Main-st. with shale brick. W. H. George, chmn. B. P. W.

Lorain, O.—Sealed bids are asked until 12 m. Sept. 11 for macadamizing Eleventh, Twelfth and Thirteenth-aves. J. J. Mahoney, cy. clk.

Niantic, Ill.—Sealed bids are asked until 6 p. m. Sept. 2, for constructing a brick walk and street crossings. J. E. Jones, vil. clk.

Indianapolis, Ind.—Sealed bids are asked until 10 a. m. Sept. 4 for building cement walks in certain streets. Albert Sahm, chmn. B. P. W.

East Cleveland, O.—Bids are asked until Sept. 7 for paving Lake Front-ave. with brick, with curbing, sewers and grading. H. B. Chapman, vil. clk.

Washington, D. C.—Sealed bids are asked until 12 m. Sept. 7 for improving Connecticut-ave., west of Rock Creek. H. B. F. MacFarland, chmn. dist. com'rs.

White Plains, N. Y.—Bids are asked until Sept. 3 for curbing and macadamizing portions of several streets aggregating about 3 mls. Wm. B. Sutherland, vil. clk.

Chagrin Falls, O.—Sealed bids are asked until Sept. 20 for 9,557 sq. yds. of brick or block paving, and 2,460 lin. ft. of curbing on three streets. E. P. Wilmot, mayor.

Corydon, Ind.—Sealed bids are asked until 11 a. m. Sept. 5 for constructing a free gravel road in Heth twp. Michael Gleitz, chmn. co com'rs.; Jas. A. Watson, co. audt.

Findlay, O.—Sealed bids are asked until 12 m. Sept. 5 for paving Second-st., from Main-st. to Washington-ave., with paving block, grading, curbing, etc. Frank C. Ray, clk.

Spencer, Ind.—Bids are asked until 7 p. m. Sept. 6 for building cement walks and cement or sawed stone curbs on each side of Washington-st., from Hillside-ave. to Franklin-st. Bd. of trustees.

Green Bay, Wis.—Bids are asked until 12 m. Sept. 9 for improving Third-st., Monroe-ave. and Duck Creek road, by grading, curbing and graveling. F. E. Murphy, chmn. com. on sts. and bridges.

Kenosha, Wis.—Sealed bids are asked until 7 p. m. Sept. 3 for 4,385 lin. ft. of brick paving on crushed stone foundation, with stone curbing, on Milwaukee-ave. Jas. Garman, chmn. st. assessment com.

Britton, S. D.—Open bids will be received Oct. 1 by the town boards of Pleasant Valley and Waverly townships for cutting down the hill and grading the approach to the bridge over the Coulee. Fred Freiss, chmn.

Des Moines, Ia.—Bids are asked until Sept. 5 for 1,922 sq. yds. of brick paving on 6-in. concrete base in two alleys, and 1,530 lin. ft. of Portland cement curbing on Atkins-st. G. A. Eberhart, chmn. B. P. W.

Oberlin, O.—Sealed bids are asked until 12 m. Sept. 17 for paving W. College-st., from Main to Prospect, with brick, with grading, draining, curbing, gutters and cross walks. Alfred Fauver, mayor; W. B. Gerrish, engr.

Paulding, O.—Sealed bids are asked until 12 m. Sept. 13 for ditching, grading, tiling, culverts and graveling the James Evans pike road, Smiley pike road, Mandale pike road, Broughton pike road and Burkle pike road. W. J. Johnson, engr.

Cincinnati, O.—Sealed bids are asked until 12 m. Sept. 2 for paving Avery alley, from Baymiller to Stone-st., with brick; until Sept. 4 for paving Pugh alley, from John-st. to Smith-court, with brick; until Sept. 9 for paving Fenton-ave., from Harrison-ave. to Wolff-st., with brick. Robert Allison, prest. bd. pub. service.

CONTRACTS AWARDED.

Le Sueur, Minn.—Contracts for $5,000 sq. ft. of cement walk have been awarded to Larson & Iten.

Iowa City, Ia.—The contract for paving College-st. with brick was awarded to Wm. Harrabin & Co.

Wichita, Kas.—T. E. Burton was awarded the contract Aug. 19 for constructing permanent walks.

Marquette, Mich.—The contract for constructing the Sands road was awarded to E. Larochelle for $1,687.

Galion, O.—The contract for paving N. Columbus-st. with brick was awarded to Baldwins & Graham.

Evansville, Ind.—Stinchfield & Saunders secured the contract for paving two alleys with brick.

Sumter, S. C.—The contract for macadamizing Main-st. was awarded to Wm. T. Fair of Newberry for $5,000.

Auburn, N. Y.—The contract for paving Genesee-st. with asphalt was awarded to the Barber Asphalt Paving company.

Syracuse, N. Y.—The contract for repairing the asphalt pavement on James-st. has been awarded to the Syracuse Improvement company.

Bay City, Mich.—Patrick Ryan was awarded the contract for paving Lincoln-ave., from Center to Sixth, with brick for $2,106.

Miamisburg, O.—The contract for paving Third-st. with brick was awarded, Aug. 8, to Tonis & Kircher at $1.34 a sq. yd.

Springfield, O.—Contracts were awarded, Aug. 6, to W. F. Payne, John Wyant and Edward Ryan for improving a number of streets.

Mason City, Ia.—The contract for paving two streets with asphalt was awarded to the Barber Asphalt Paving company at $1.89 a sq. yd.

Mitchell, S. D.—The contract for constructing cement gutters was awarded, Aug. 15, to Gottlieb Schwersenbrand at 18 cents a sq. ft.

Brainerd, Minn.—The contract for furnishing curbing for Seventh-st. was awarded to the Arnold Granite company of St. Cloud, Minn.

Albert Lea, Minn.—D. M. Dominick was awarded a contract Aug. 9 for building a cement walk through the city park for $275.

Wapakoneta, O.—The contract for paving Auglaize-st. with brick was awarded Aug. 5 to David A. Oukot of Dayton for $16,654.

Cincinnati, O.—The contract for paving Wingate alley, from Cutter to Kenyon, with brick was awarded to M. F. Flynn for $1,172.33.

Canandaigua, N. Y.—The contract for building a telford macadam road on Howell-st. was awarded to Contractor Driscoll for $5,200.

Dubuque, Ia.—The contract for paving Sinisinawa-ave., in East Dubuque, with brick was awarded Aug. 20 to Coyle & Werner of this city.

Paris, Ill.—The contract for sixteen blocks of street paving was awarded to J. M. Williamson at $1.65 a sq. yd. for Poston block on concrete.

Scottsburg, Ind.—The contract for building 8 miles of gravel roads in Vienna and Finley twps. was awarded to Chas. Calvert for $3,890.

Madison, Wis.—Contracts for street improvements have been awarded to Nicholas Quinn for $27,856 and to Mitchell Bros. for $3,125.

Pontiac, Mich.—Lennane Bros. of Saginaw have been awarded the contract for paving Pike-st. with asphalt block on gravel for $12,208.37.

Lamar, Mo.—The contract for building a concrete sidewalk on the south side of the square was awarded to C. A. Ruggles of Fayetteville, Ark.

Fowler, Ind.—The contract for brick street paving was awarded to H. C. Finley of Hoopeston, Ill., at $1.34 a sq. yd. and 45 cts. a lin. ft. for curbing.

Newark, N. J.—The Barber Asphalt Paving company was awarded contracts Aug. 15 for asphalt paving in S. Ninth, Fourth, Second and S. Tenth and Clayton-sts.

Preston, Minn.—The contract for building cement walks around the court house was awarded to the La Crosse Stone Sidewalk company of La Crosse, Wis., at 18½ cts. a sq. ft.

Indianapolis, Ind.—The contract for paving New York-st., from Blake-st. to Urbana, with asphalt was awarded to the Western Construction company at $3.52 a ft. each side.

Marinette, Wis.—Welch, Patterson & Striffler of Springfield, Ill., secured the contract, Aug. 20, for macadamizing Ludington and Wells-sts. at 85 cts. a sq. yd.

Oklahoma City, Ok. T.—The contract for paving the business district of this city with brick was awarded, Aug. 4, to L. F. Krumer of this city at $1.85 a sq. yd.

Urichsville, O.—The contract for building three miles of pike road between this city and Newport was awarded to Oppenzeller & Bunnbaugh of Greenville, O., for $28,000.

Indianapolis, Ind.—The contract for paving Meridian-st., from Fall creek to Thirty-fourth-st., with creosoted wooden blocks was awarded to the Hoosier Construction company at $6.04 a lin. ft.

Columbus, O.—The contract for improving Gates-st., from High to Mozart, was awarded, Aug. 12, to W. M. Graham for $2,564. The Barber Asphalt Paving company was awarded the contracts for street repairs.

Hoboken, N. J.—The contract for improving Sanford-place, from Summit-ave. to Zabriskie-st., was awarded, Aug. 13, to Edward W. Conlon; for improving North-st., from Hudson boulevard to Summit-ave., Edward W. Conlon.

New Haven, Conn.—Bids were received Aug. 16 for paving Church-st. with asphalt, as follows: New England Improvement company, $2.81 a sq. yd.; Central Asphalt company of Hartford, $2.92 a sq. yd. Action on the bids was deferred.

Moline, Ill.—Contracts for paving have been awarded as follows: Barber Asphalt Paving company, Twenty-second-st., $7,884; J. J. Duffy Asphalt company of Chicago, Twentieth-st., $8,160; Tri-City Construction company of Davenport, Ia., $4,625.

Baltimore, Md.—The Washington Asphalt Block and Tile company was awarded the contract Aug. 14 for paving Bayard-st., form Columbia-ave. to Herkimer-st., with asphalt block, at $2.30 a sq. yd., and 20 cents a cu. yd. for grading.

St. Paul, Minn.—The R. F. Conway company was awarded the contract Aug. 6 for

paving Marshall-ave. with asphalt, at $1.77 a sq. yd., or $29,900. Fielding & Shepley secured the contract for curbing and boulevarding Ashland-ave., from Dale to Victoria-st. for $4,085.

Council Bluffs, Ia.—The contract for paving the Fourth ward was awarded Aug. 12 to E. A. Wickham, at $1.74 a sq. yd., or $61,352.40. The paving will be two-course brick, the top course of Galesburg brick and the bottom course of Council Bluffs brick.

Des Moines, Ia.—The Capital City Brick and Pipe company was awarded the contract for paving Twenty-second-st., between University and Cottage Grove-aves., with asphalt, at $1.98 a sq. yd., and 44 cents a lin. ft. for curbing. O. P. Herrick was awarded the contract for grading at 32¾ cents a sq. yd.

Macomb, Ill.—The contract for paving the streets leading to the Normal school with brick was awarded Aug. 7 to the Tri-City Construction company of Davenport, Ia., as follows: Excavating, 20 cents a cu. yd.; paving, $1.28 a sq. yd.; Berea stone curbing, 40 cents a lin. ft.

Ft. Wayne, Ind.—Bids were received Aug. 9 for paving E. Wayne-st., from Hanover to Grant with brick or asphalt, as follows: Indiana Bermudez Asphalt company, asphalt, $7.90 a lin. ft.; Barber Asphalt Paving company, asphalt, $7.67; C. E. Moellering & Co., Canton brick, $6.55.

East Newark, N. J.—The contract for paving Searing-ave. with Mack wire-cut brick was awarded Aug. 14 to the Newark Paving company at $2.29 a sq.yd., and the contract for paving Central-ave. with asphalt was awarded to the Barber Asphalt Paving company at $2.12½ a sq. yd.

Muscatine, Ia.—(Special.)—James J. Ryan, cy. engr., says that Fuller Bros. were awarded the contract Aug. 13 for 20,000 sq. yds. of brick paving at $1.19½ a sq. yd.; excavation, 23 cts.; stone curbing, 4x22 in., 48 cts.; stone curbing, 4x18 in., 34 cts.; total, $32,190.

Brooklyn, N. Y.—Contracts for repaving a number of streets with asphalt were awarded Aug. 6 as follows: Crawford company., Classon-ave., $24,659.52; Caton-ave., $13,814.75. Eastern Bermudez company: Hooper-st., $19,089; Alabama-ave., $12,954.92; Sackman-st., $14,318.38. Brooklyn Alcatraz company: Fifteenth-st., $66,878.99.

Milwaukee, Wis.—Contracts for asphalt paving have been awarded as follows: Barber Asphalt Paving company: Oneida-st., 3,505 sq. yds.; Johnson-st., 1,661 sq. yds., and Thirteenth-ave., 3,521 sq. yds., $2.24 a sq. yd. Western Paving company: Maryland-ave., 2,290 sq. yds.; Frederick-st., 1,137 sq. yds.; Linwood-ave., 4,084 sq. yds., and Milwaukee-st., 1,999 sq. yds., $2.25 a sq. yd.

Middletown, O.—(Special.)—Frank Doty, city engr., says that bids were received Aug. 1 for paving Middle alley with brick on 4 in. concrete base, as follows: F. M. Kemp & Sons., Trimble block, $1,579.82; Townsend brick, $1,615.56; Medal block, $1,669.27. E. Deitrick: Kentucky brick, $1,638.18; Hallwood, $1,647.12. George Kindred: Harris block, $1,706.43; Townsend block, $1,724.40. F. Smith: Metropolitan block, $1,667.74; Bolen Brown, $1,660.81; Townsend, $1,678.68.

Rochester, N. Y.—The Thomas W. Finncane company was awarded the contract, Aug. 12, for paving Park-ave. with brick, for $12,708.50; Grape-st. with brick, for $5,211.50; Orange-st., trap rock, $5,832. Whitmore, Rauber & Vicinus secured the contract for paving Holland-st. with asphalt, for $6,487.05. Contracts were awarded Aug. 16 as follows: Whitmore, Rauber & Vicinus—Montgomery alley, asphalt, $2,745; Grape-st., from Wilder to Jay, brick, $13,810.50; Pleasant-st., asphalt, $5,125.90. H. B. Hooker & Son—Meigs-st., trap rock macadam, $8,298.

Salt Lake City, Utah—(Special.)—L. C. Kelsey, cy. engr., says the Alcatraz Asphalt Paving company was awarded the contract Aug. 2 for paving Second-st. S. and Third-st. S., and for repairing asphalt pavements, as follows: Grading, 13,000-cu. yds., 45 cts.; curbing, 10,500 lin. ft., $1; resetting curb, 100 lin. ft., 30 cts.; stone block paving, 11,500 sq. yds., $2.70; asphalt paving, California asphalt, 32,000-sq. yds., $2.40; cross-walk, 2,000-sq. ft., 45 cts.; concrete gutter, 1,000 lin. ft., $2.10; repairing asphalt pavements, 3,000-sq. yds., $1.35; resurfacing, 6,000 sq. yds., $1.40; concrete masonry, 100 cu. yds., $6; total, $140,280.

Birmingham, Ala.—Contracts for street improvements were awarded Aug. 7 as follows: Donelson & Colvin—Grading and macadamizing portions of Second and Third-aves., and curbing Third-ave., $9,328; Watkins & Co.—Grading and macadamizing portions of Avenues H, J and M, and Twenty-sixth and Seventeenth-sts., $34,905; Contractor Sanders—Artificial stone walks on Twenty-second, Twenty-third and Twenty-fourth-sts., and Second, Third and Fourth-aves., $7,235; Burkhalter & Co.—Grading and macadamizing Avenue F, $10,245, and Thirteenth and Fourteenth-sts., $24,370; Dunn & Lallande Bros.—Grading and macadamizing Third and Seventh-aves., and curbing Third, Second, Fifth and Seventh-aves., $25,386.

Chicago, Ill.—The contract for paving Archer-ave. from Stewart to Ashland-ave. with asphalt was awarded, Aug. 20 to the R. F. Conway company for $113,849. Contracts for curbing, grading and paving various streets have been awarded as follows: Citizen's construction company, paving with virtified brick, granite blocks and granite macadam; Jas. Conlon, broken furnace slag with granite top dressing; R. F. Conway and company., granite top macadam, cedar blocks and asphalt; Henry Rath, granite top macadam, Western paving and supply company, asphalt; Jos. J. Duffy and company, asphalt; Dolese and Shepard, granite top macadam; Illinois improvement company and Ballast company, blast furnace slag and gravel; C. M. Wetterstrom and company, granite top dressing; Farr Bros. and company, blast furnace slag and crushed limestone, Smith, Moss & Brown, cedar blocks.

Lincoln, Neb.—Bids were received Aug. 19th for asphalt paving, from the R. F. Conway company of Chicago, and the Barber asphalt paving company. The prices were from 21 to 24 cents lower per sq. yd. than on former contracts. The bills were as follows: Repaving Eleventh-st., district, 2-in. wearing surface, 1½-in. additional concrete, Barber asphalt paving company, $1.78

a sq. yd.; R. F. Conway company, $1.69; 1½-in. wearing surface, 1½-in. binder, and 2-ins. additional binder, Barber asphalt paving company, $1.70; R. F. Conway company, $1.61. Repaving P-st. district, 2-in. wearing surface, 1½-in. binder, 2½-in. additional concrete, Barber asphalt paving company, $1.83; R. F. Conway company, $1.81; 2-in. wearing surface, 1½-in. binder, and 1½-in. binder laid on old concrete, Barber asphalt paving company, $1.58; R. F. Conway company, $1.59.

SEWERS.

New Orleans, La.—Arthur Thatcher of St. Louis has been appointed to serve with Clemens Herschel and Lewis Johnson on the board appointed to arbitrate the differences between the New Orleans drainage commission and the National Construction company.

Norwich, Conn.—Chas. W. Comstock of Montville has filed suits for $5,000 each against this city, the Dime Savings Bank, Nicholas Tarrant and the Ossawan mills company, claiming pollution of a pond owned by him, through sewage being emptied into it by the defendants. He also asks for an injunction to restrain the parties named from continuing the sewer into the pond.

Fond du Lac, Wis.—The committee appointed to investigate the removal of the septic tank plant submitted its report Aug. 21. The cost of removing the plant, together with the extension of the sewer main, will be $16,000. This includes the work that has been started on the present plant. The committee favors the erection of the plant on the present site. The report was adopted.

Fergus Falls, Minn.—A decision was filed Aug. 13 by Judge Amidon of the U. S. court, in the case of J. B. Clough vs. the town of Farley. The plaintiff held $5,000 worth of drainage bonds against the town, which repudiated them on the ground that a mistake was made in laying out the town boundaries. The town officials who signed the bonds were not residents of what is now the town of Farley, and a part of the money was expended outside of what is now the town limits. Judge Amidon held that the town must pay just the same and rendered judgment in favor of the plaintiff.

CONTEMPLATED WORK.

Nampa, Idaho—A sewerage system is proposed.

Rochester, Mich.—Surveys are being made for a sewerage sytsem.

Lincoln, Ill.—A sewer on Broadway-st. has been petitioned for.

Mapleton, Minn.—The council voted to build a sewer on Second-st.

Racine, Wis.—A sewerage system is proposed for the county asylum.

Oskaloosa, Ia.—Petitions have been submitted to the council asking for sewers.

Cohoes, N. Y.—The residents of Niver-st. have petitioned for a sewer.

Trenton, N. Y.—The question of building a sewerage system is being agitated.

Pueblo, Col.—An ordinance is pending creating two storm sewer districts.

Rome, Ga.—A better sewerage system is proposed. C. H. Lavender, chmn. com.

Elgin, Ill.—The question of constructing a sewer on Highland-ave. is being agitated.

Galt, Ont.—This city is in need of storm drains, according to press reports.

Ashland, O.—Surveys are being made for sewers and sewage disposal plant. S. W. Hull, clk.

Rochester, Ind.—Plans for a sewerage system have been completed. E. E. Murphy, cy. clk.

Wyandotte, Mich.—Plans for new sewers will be submitted to the board of public works soon.

Cincinnati, O.—A resolution for a complete sewerage system on Price Hill has been approved.

New Castle, Ind.—Bids will be asked soon for building over six miles of sewer. W. H. Adams, clk.

Sac City, Ia.—Plans are being prepared for 2,600 ft. of sewers. T. F. Mansfield, chm. com.

Camden, N. J.—An ordinance was passed Aug. 15 to issue $50,000 bonds for building sewers.

St. Charles, Mo.—Plans for the Clark-st. sewer have been referred to City Attorney Haenssler.

Hancock, Mich.—Plans for a sewerage system will be prepared by S. D. Austin, C. E., of Milwaukee, Wis.

Terre Haute, Ind.—Estimates for new sewers in a number of streets have been submitted to City Engineer Sparks.

Sarnia, Can.—Notice of intention to build a number of tile sewers was published Aug. 15. J. D. Stewart, town clk.

Erie, Pa.—Ordinances were passed Aug. 12 providing for sewers in Myrtle, Twenty-second and Twenty-third-sts.

Charlotte, Mich.—Plans for a sewerage system have been completed by Riggs & Sherman of Toledo, O.

East St. Louis, Ill.—It is believed that the proposed grand trunk sewer will be built soon. Mayor Stephens.

Albany, N. Y.—Mayor Blessing approved resolutions Aug. 21 providing for sewers in Elk and Jackson-sts.

Delray, Mich.—The council has been asked to build a portion of the sewerage system instead of the entire plant.

Reynoldsville, Pa.—Bids have been authorized for sewers in Hill and Fourth-sts. H. C. Deible, prest. town council.

Portland, Or.—Plans for a sewerage system are being prepared by City Engineer Chase.

Perth Amboy, N. J.—An ordinance was passed Aug. 19 providing for a sewer in State-st. John F. Rielley, cy. clk.

Ridgefield, Conn.—Plans for a sewerage system have been accepted. W. O. Seymour, Sam'l Keeler, D. Smith Sholes, com.

Fond Du Lac, Wis.—The city engineer has been directed to prepare plans for a sewer on Thirteenth-st. and Park-ave.

Mohawk, N. Y.—This town voted against the issue of bonds for sewers and it is probable that another election will be held.

Canon City, Col.—An ordinance has been adopted providing for the construction of a sewerage system at a cost of $55,000.

The question of issuing bonds for building sewers and sewerage systems will be voted on at the following places: Nampa,

Idaho; Madison, N. J.; Canonsburg, Pa., Sept. 24.

Battle Creek, Mich.—A sewer in McCauly-st., from the Kalamazoo river to near Liberty-st., is proposed. H. F. Harvey, secy.

The extension of sewers is proposed as follows: Paris, Ill., Mayor Baum; Knoxville, Tenn., T. J. Moreland, cy. engr.; Milton, Pa.

Marshall, Mich.—A report was adopted Aug. 12 recommending a sewer on E. State-st., from Marshall-ave. to the Old Ladies' Home.

Pomona, Cal.—A resolution has been passed providing for the construction of sewers, at a cost of $50,000. W. H. Saunders, cy. engr.

Mankato, Minn.—A resolution was passed Aug. 16 providing for a sewer on Walnut-st., between Fifth and Sixth. Nic Peterson, mayor.

Mt. Pleasant, Ia.—Plans and specifications for a sewage disposal plant for the Iowa Hospital for the Insane are being prepared. C. F. Applegate, supt.

Grafton, W. Va.—The town council has directed the street committee to survey the town preliminary to the construction of a complete sewerage system.

Akron, O.—Resolution were passed Aug. 19 providing for the construction of main trunk sewers in districts 3, and 10, and local sewers in several streets.

Los Angeles, Cal.—City Engr. Stafford is preparing plans and estimates for a new 6-ft. masonry outfall sewer to the ocean. It is believed the sewer will cost $750,000.

Grinnell, Ia.—A resolution will be considered for passage Sept. 2 which provides for a vitrified pipe sewer in certain streets. H. W. Spaulding, mayor; J. F. Wilson cy. clk.

The construction of a sewer system is contemplated at the following places: Knoxville, Ia.; Franklin, Mass.; Wagoner, Ind. T.; Manchester, Conn.; Shawano, Wis.; Washington, Pa.; Vacaville, Cal.

Traverse City, Mich.—The plans and estimates of the city engineer for a trunk and lateral sewer extending to the Oak Park school in the Fifth ward were accepted by the council Aug. 19. J. W. Patchin, mayor.

Trenton, N. J.—Plans were submitted to Governor Voorhees Aug. 13 providing for the connection of the state hospital and the state home for girls with the proposed sewerage system from Cadawalader Park.

West Springfield, Mass.—The plans for the sewers to enter the river by submerged outlets at the Sawmill brook and at the Chicopee bridge have been approved by the state board of health. The work of construction will soon begin.

The question of issuing bonds for building sewers and sewerage systems has been favorably voted on as follows: Woonsocket, R. I., $29,600 for sewers; Concord, N. H., $6,000, sewer; Mt. Carmel, Pa., sewerage system, Isaac Lemble, boro engr.

Long Island City (L. I.) N. Y.—Bids will be asked for the construction of the Ingleside sewers in Flushing, which will comprise two trunk lines connecting with a system of lateral sewers and with a disposal plant at Ingleside. The estimated cost is $200,000.

Hartford, Conn.—The state sewerage commission has appointed Prof. E. H. Jenkins of New Haven president of the commission and Robert A. Cairns of Waterbury secretary, as a committee to investigate the matter of a location for an experimental sewage disposal plant.

Galion, O.—A resolution has been adopted by the municipal association to appoint a committee to wait on the city council and urge immediate action toward procuring ground for a sewage disposal plant and to provide at once for the construction of a complete sewerage system.

Springfield, O.—J. D. Cook, C. E., of Toledo, O., who has been investigating the water supply of this city, says that a sewage disposal system is of more vital inportance to the city than the water supply. W. H. Sieverling, cy. engr., is preparing plans for a sewer in the southwestern and western portions of the city.

Indianapolis, Ind.—B. J. T. Jeup, city engr., has suggested a plan for the abatement of stench arising from sewage at the mouth of the White river intercepter. This plan provides for the construction of a flume from the mouth of the sewer into the middle of the river, thus carrying the sewage to the channel of the stream, where it would be taken away. The estimated cost of the flume is $1,500. A plan is also proposed by which the stream may be cleared of the waste and at the same time the refuse made use of.

CONTRACTS TO BE LET.

Portland, Me.—Bids are asked until Sept. 3 for 1,120 feet of brick sewer. G. M. Fernald, com'r pub. wks.

Paris, Ky.—Bids are asked until 12 m. Sept. 2 for constructing a sewerage system. Benj. Thompson, engr.

Paw Paw, Mich.—Bids are asked until Sept. 2 for constructing 13,677 ft. of sewers. W. H. Mason, vil. engr.

Oshkosh, Wis.—Bids are asked until 12 m. Sept. 16 for building sewers in Jackson and Murdock-sts. B. P. W.

Canyon City, Col.—Bids are asked until Oct. 1 for building 12 miles of 8 to 24-inch sewers. L. C. Hall, cy. engr.

Otto, Pa.—Bids are asked until Sept. 7 for a sewer in Monongahela-ave. P. S. McMullen, boro engr., Glassport, Pa.

Wausau, Wis.—Bids are asked until 4 p. m. Sept. 2 for building sewers in several streets; J. R. Patzer, cy. clk.

Monaca, Pa.—Sealed bids are asked until 8 p. m. for building a 24-in. sewer on Pennsylvania-ave. E. E. Sproull, prest. coun.

Kenton, O.—Bids are asked until Sept 3 for building sewers in dist. No. 2. O. P. Wilson, cy. engr.; John P. Dugan, cy. clk.

Winchester, Ind.—Sealed bids will be received until Sept. 25 for constructing the main sewer, 6,600 ft. long. C. C. Gunker, engr.

Dayton, O.—Bids are asked until Sept. 3 for constructing lateral sewers in dists. Nos. 4 and 5. Robt. H. Ferguson, cy. compt.

Toledo, O.—Bids are asked until Sept. 10 for building circular pipe sewers in Wilson and other streets. J. E. Connell, cy. clk.

Ligonier, Ind.—Sealed bids are asked until 8 p. m. Sept. 5 for building a sewer. Orean

W. Christie, mayor; R. E. Jeanneret, cy. clk.

Plainfield, N. J.—Bids are asked until Sept. 9 for constructing 4,000 ft. of pipe sewers. A. J. Gavett, engr.; Geo. B. Wean, cy. clk. pro tem.

Tacoma, Wash.—Sealed bids are asked until 2 p. m. Sept. 3 for sewerage work for the new state capitol. D. B. Garrison, secy. State Capitol com'n.

Glenville, O.—Sealed bids are asked until 12 m. Sept. 2 for constructing storm sewers in St. Clair-st. and gravel road. Ira C. Farley, vil. clk.

Fergus Falls, Minn.—Bids are asked until 10 a. m. Sept. 10 for digging and constructing ditch No. 3 in sections of 100 feet. W. C. Lincoln, co. audt.

Nadeau, Kas.—Sealed bids are asked until 2 p. m. Sept. 6 for constructing a sewerage system for the Pottawatomie boarding school. W. A. Jones, com'r. Washington, D. C.

Cleveland, O.—Sealed bids are asked until 12 m. Sept. 17 for constructing a conduit to divert Giddings brook through Baldwin-ave., into Doan creek. Chas. P. Salem, dir. pub. wks.

Cincinnati, O.—Sealed bids are asked until 12 m. Sept. 16 for building sewers in portions of Price, Warsaw, Garfield and Elberson-aves. and Eighth-st. Robert Allison, prest. B. P. S.

Kings Park (L. I.) N. Y.—Bids are asked until Sept. 2 for constructing a sewage disposal plant at the Long Island State Hospital. A. E. Orr, prest.bd. mgrs., Clinton and Montague-sts., Brooklyn.

Great Falls, Mont.—Sealed bids are asked until 8 p. m. Sept. 3 for constructing a lateral sewer in dist. No. 15, including one manhole, one lamphole and one flush-tank. W. H. Smith, cy. clk.

New York City—Bids are asked until Sept. 4 for building sewers in a portion of Twelfth-ave., Borough of Manhattan, and in several streets in the boroughs of Bronx and Brooklyn. Matthew F. Donohue, deputy and acting com'r. of sewers.

CONTRACTS AWARDED.

Emporia, Kas.—The contract for building two sewers was awarded to J. W. Tipton.

Akron, O.—The contract for building a sewer in Vine-st. was awarded to John O'Neil.

Vassar, Mich.—The contract for building a sewer was awarded to E. Teetzel for $1,300.

Detroit, Mich.—Sewer contracts were awarded Aug. 7 to Thomas G. Whittaker and J. G. Affeld & Son.

Endicott, N. Y.—The contract for installing a sewerage system was awarded to Gaylord & Eitapene.

Fowler, Ind.—W. F. Frey of Lafayette, Ind., was awarded the contract for a sewer in this city for $9,200.

Merrill, Wis.—The contract for constructing sewers was awarded Aug. 5 to Harding & Nelson of Racine, Wis.

Woodbury, N. J.—The contract for constructing two sewage disposal beds was awarded to E. P. Henry for $4,884.

Camden, N. J.—B. F. Sweeden & Son and William Thompson secured contracts for a number of sewers in South Camden.

Crookston, N. D.—James Kennedy was awarded the contract for building a sewerage system for about $2,600.

Baraboo, Wis.—Otto Schadde was awarded the contract for building a sewer on Ash-st., between Fifth and Seventh.

Springfield, Ill.—The contract for constructing the town branch sewer was awarded to William Spence at $19 a lin. ft.

Waukesha, Wis.—Robert Devereaux was awarded the contracts for constructing sewers on Charles-st. and Oakland-ave.

Grinnell, Ia.—A. Huebner & Co. secured the contract for laying an 8-in. sewer in Sixth-ave., at 15 cts. a lin. ft.

Duluth, Minn.—The contract for building the new Normal school sewer was awarded Aug. 19 to Fitzgerald & Norris, for $4,887.40.

Joplin, Mo.—The contract for building the East Joplin sewer was awarded Aug. 6 to the Joplin Improvement and Construction company.

New Brighton, Pa.—The contract for sewerage construction was awarded Aug. 5 to Frederick Robinson of Meadville, Pa., for $4,198.

Carthage, Mo.—The contract for building a sewer in dist. No. 2 was awarded to W. W. Cook & Son of Junction City, Kas., for $6,484.

Sharon, Pa.—The contract for building sewers on the principal streets was awarded to William McIntyre, jr., of this city, for $93,000.

Coldwater, Mich.—C. W. McKinney of Toledo, O., was awarded sewer contracts Aug. 14 as follows: Race-st., $6,125.60; Clay-st., $5,281.30.

Michigan City, Ind.—John Renkawitz & Co. secured the contract Aug. 13 for constructing sewers in Cedar and Boston-sts., and in two alleys.

Lewes, Del.—Harry A. Miller of Wilmington, Del., was awarded the contract for constructing the sewerage and water systems, for $36,173.37.

Sherman, Tex.—The contract for building a sewerage system for this city was awarded to Black & Laird of Kansas City, Mo., for $71,000.

St. Paul, Minn.—Sewer contracts were awarded Aug. 5 as follows: Snelling-ave., R. H. Thornton, $2,417; Indiana-ave., John Lind, $1,050.

Watertown, N. Y.—W. J. Semper was awarded a contract Aug. 6 for a trunk sewer in Winslow-st., and Alvin F. Nims for a trunk sewer in Washington-st.

Milwaukee, Wis.—The contract for constructing the third section of the Kinnickinnic river flushing tunnel was awarded to Richard Forrestal at $39.40 a ft.

Birmingham, Ala.—Dunn & Lallande were awarded contracts for sewers as follows: Twenty-third-st. and Magnolia-ave., $26,452.50; Twenty-seventh-st. and alley G $612.50.

Newcastle, Pa.—The contract for constructing a main sewer was awarded to Irwin Bros. of Greenville, O., for $59,124; for the Big Run sewer, J. W. Mitchell, $3,053.

Syracuse, N. Y.—C. T. Hookaway was awarded the contract for a sewer in Oneida-st. for $1,390.55; S. Street, sewer in Hudson-st., $528; George W. Dakin, Division-st., $446.

Washington, D. C.—The Allis-Chalmers company of Milwaukee was awarded the

contract for the machinery for the sewage disposal station, to be built at the foot of New Jersey-st., for $253,000.

Middletown, O.—(Special.)—Frank Doty, cy engr., says bids were received Aug. 3 for building sewers in Clinton and Basin-sts. as follows: John Arpp., $711.33; William Hilt, $860.68; George Kindred, $817.82.

Great Falls, Mont.—(Special.)—The contract for constructing a lateral sewer through the alley between Sixth and Seventh-aves., north, from Sixth to Eighteenth-sts., was awarded Aug. 19 to F. R. Hinds of Butte, Mont., for $10,370.60.

Melrose, Mass.—Bids were received Aug. 21 for constructing sewers as follows: H. A. Hanscom Co., 53 State-st., Boston, $16,489; C. E. Trumbull & Co., Tremont building, Boston, $12,667; Seymour & Newell, Springfield, Mass., $12,014; F. E. Ellis, Melrose, $11,776.

Shreveport, La.—Bids were received by the Shreveport W. W. company for building a sewerage system in Holmesville, Texarkana, Annex and Allendale as follows: Guild & Co., of Chattanooga, Tenn., $97,260; John S. Shea, St. Louis, $98,950; E. A. Burkhalter of Birmingham, Ala., $105,724.

WATER-WORKS.

Cannelton, Ind.—This city has purchased the water works plant of the Cannelton water company, for $18,900.

Richwood Falls, Minn.—The water tank failed recently. It was erected in 1892 and had a capacity of 90,000 gals.

Carthage, Mo.—The city council contemplates the purchase of the water works plant when the present franchise expires.

Glenwood, Wis.—The water works plant of the Glenwood manufacturing company burned, Aug. 16, entailing a loss of $50,000.

Ogden, Utah—An ordinance has been adopted fixing the regular water rates and providing a new schedule reducing the present rates from 25 to 30 per cent.

Des Moines, Ia.—The question of adopting the contract with the Fruin-Bambrick construction company for building a water works system will be voted on Sept. 7.

Los Angeles, Cal.—The Los Angeles city water company and the city council have agreed on the sale of the works to this city for $2,000,000, subject to approval of a popular vote.

Pittsburg, Pa.—Jonathan Clark & Sons company of Chicago has filed suit in the U. S. court for money claimed to be due from the city of Pittsburg for contract for the construction of Highland reservoir No. 2.

Florence, Col.—This city, Pueblo, Canon City and Salida will make an effort to secure a permanent injunction restraining the power mines in and about Granite from polluting the water of the Arkansas river.

Cincinnati, O.—Quigley & Thompson, who bought the contract from Hinkel & Sullivan for the construction of the new reservoirs, discharged their employes, Aug. 16, for an indefinite length of time, and stopped all work, owing to a dispute regarding the manner in which they were conducting the work.

Appleton, Wis.—The Appleton water works company served notice on the mayor and common council, Aug. 13, warning them that, if they built a new water works plant in this city, the present company will hold them responsible for any damages resulting The company claims the right to renew its present contract at the time of its expiration, and denied the right of the city to construct a new system.

CONTEMPLATED WORK.

Sioux Falls, S. D.—A municipal water plant is proposed.

Windfall, Ind.—Estimates for waterworks have been approved.

Frostburg, Md.—The construction of a reservoir is contemplated.

Neligh, Neb.—Bonds have been voted for improving the water works.

Camden, O.—The construction of waterworks is urged by the press.

Ishpeming, Mich.—The improvement of the water works system is proposed.

Rolfe, Ia.—The question of extending the water mains will be voted on Sept. 2.

Dowagiac, Mich.—The question of purchasing a new pump and meters is being considered.

Lynn, Mass.—The water board has asked for authority to borrow $400,000 for improvements.

Oswego, N. Y.—The question of purchasing the water works for $550,000 will be voted on.

El Dorado Springs, Mo.—Plans and specifications are being prepared for a waterworks system.

Birmingham, Ala.—The Birmingham W. W. Co. will make a test of the meter system for nine months.

Milwaukee, Wis.—A pipe line from Pewaukee lake to supply the town of West Allis with water is proposed.

Kokomo, Ind.—A stone quarry has been purchased for a site for the proposed municipal waterworks.

Knoxville, Tenn.—The question of municipal ownership of the water works plant will be voted on Sept. 28.

Caldwell, N. J.—A committee will be appointed to investigate the best source of water supply. Mayor Espy.

Sears, Ill.—A plan is being devised for procuring water works. C. H. Debbern and E. D. Fisher are on the committee.

East Orange, N. J.—The city engineer has been directed to prepare plans and specifications for a water works system.

Harrodsburg, Ky.—The question of municipal ownership of water works and electric light plant is being agitated.

Bowling Green, O.—A resolution has been adopted directing the water company to lay 1,400 ft. of pipe on each end of Main-st.

Sarnia, Can.—The question of removing the water works plant of this city to the shore of Lake Huron is being discussed. Mayor Logie.

Phoenix City, Ga.—According to the plans of Alber & Byrne of Birmingham, Ala., the proposed water works plant for this city will cost $22,524.

Glenwood, Wis.—The city council voted Aug. 20 to purchase a gasoline engine and pump to afford fire protection until the water plant can be rebuilt.

Richmond, Va.—A resolution was adopted Aug. 5 preparatory to an investigation by the water committee of the feasibility of the city's water supply.

Chicago, Ill.—Negotiations are pending for the purchase of a site near One Hundred and Thirteenth and State-sts. for a new South Side pumping station.

Pilger, Neb.—Wm. Church, D. Matheson and Geo. Munger have been appointed a committee to investigate the cost and submit plans for a water works system.

Baraboo, Wis.—A resolution has been passed providing for the annulment of the franchise of the Baraboo Water Works company and the issue of bonds for a new plant.

Allegan, Mich.—Plans are being discussed for the improvement and extension of the water works system and the question of putting in a new pumping station will be voted on Sept. 11.

Minneapolis, Minn.—The water works committee of the council has instructed the city engineer to make soundings at the North Side Station to ascertain if a foundation could be found for a third pump.

Austin, Tex.—A resolution was adopted Aug. 15 directing Supt. Patterson to transfer one of the large dynamos to another section of the plant and connect it with the 6,000,000-gallon pump.

Meridian, Miss.—The mayor and city officials have been requested by the citizens to continue their investigations as to the best means of providing a pure and adequate water supply under municipal control.

Carthage, N. Y.—Jas. P. Brownell, C. E., has completed the preliminary survey between this place and the Crogan Springs, and announces as feasible the scheme for piping the water of the springs to this city.

The extension of water mains is proposed at the following places: Decatur, Ill.; Philips, Wis.; Niles, O.; Montreal, Canada; Terre Haute, Ind.; Moline, Ill.; Springfield, O.; Chatham, N. J.; Waukegan, Ill.; Sherburn, Minn.; Holland, Mich.

The question of issuing water works bonds has been favorably voted on at the following places: Webster, S. D.; Merrillan, Minn.; Grand Meadow, Minn.; Bradford Junction, O.; Glidden, Ia.; Myrtle Point, O.; Swea City, Ia.; Plymouth, O.

Fresno, Cal.—(Special.)—J. Teilman, city engr., says that at the last meeting of the board of trustees, City of Fresno, the city engineer was instructed to prepare plans for water works and electric light plant to be submitted to the board within three months.

The question of issuing bonds for building water works will be voted on as follows: Mooresville, N. C.; Sloan, Ia.; Lawton, Ok. T.; Belleville, Ill.; Rushville, Ill.; Caldwell, Idaho; Bedford, Ia., Sept. 3; Cambridge, Minn.; Evansville, Wis.; Lenox, Ia., Sept. 9; Cadott, Wis., Sept. 10; Alfred, N. Y., Sept. 17; Blackstone, Va., Sept. 10; Sardis, Miss.; Ironton, O.; Stonington, Ill.

The construction of water works is contemplated at the following places: Nassau, N. Y.; Normal City, Ind.; Thief River Falls, Minn.; Elmer, N. J.; Anthon, Ia.; Nampa, Idaho; Trenton, N. Y.; Foley, Minn.; Peshtigo, Wis.; Flora, Ill.; Columbus Grove, O.; Fayette, Miss.; New London, Wis.; Chester, Ia.; Georgetown, Del.; Covington, La.; Howell, Ind.; Wagoner, Ind. T.; Ellensburg, Wash.; Walnut Ridge, Ark.; Ryebeach, N. H.; Mt. Olive, Ill.

CONTRACTS TO BE LET.

Hopkins, Minn.—Bids are asked until 12 m. Sept. 2 for a water works system. E. A. Close, vil. rec.

Laurel, Neb.—Sealed bids are asked until Sept. 6 for a water works system. M. H. Dodge, vil. clk.

Centralia, Ill.—Sealed bids are asked until Sept. 3 for building a dam for the reservoir. W. D. Richardson.

Oelwein, Ia.—Bids are asked until 8 p. m., Sept. 2, for an extension to the water works. H. V. Hoyer, cy. clk.

Hendricks, Minn.—Sealed bids are asked until Sept. 3 for building a water works system. R. M. Burlingame, vil. rec.

Garretson, S. D.—Bids are asked until Sept. 11 for a compressed air water works system. G. H. Vandewater, cy. audt.

West Minneapolis, Minn.—Sealed bids are asked until 12 m., Sept. 2, for a water works system. Paul Swenson, prest. vil. coun.

Nadeau, Kas.—Sealed bids are asked until Sept. 6 for a water system at the Pottawatomie boarding school. W. A. Jones, comr. Indian Affairs, Washington, D. C.

Washington, D. C.—Sealed bids are asked until 12 m. Sept. 21 for constructing a pumping station on Trumbull-st. N. W., between First and Fourth-sts. H. B. F. McFarland, chrm. dist. comrs.

Joliet, Ill.—Sealed bids are asked until 7:30 p. m. Sept. 3 (postponed from Sept. 2) for furnishing a new air compressor for the water works plant. Richard Barr, mayor; Sam C. Rickson, cy. clk.

Washington, D. C.—Sealed bids are asked until 12 m. Oct. 5 for furnishing and delivering twenty water gates of 30, 36, 42 and 48-inch diameter, equipped with hydraulic operating cylinders. H. B. F. MacFarland, chrmn. dist. comrs.

Geneva, O.—Sealed bids are asked until 12 m. Sept. 4 for the installation of a pumping station and the construction of a gravity filtering plant on Grand river, and the construction of the foundation walls and stone bulkhead for the pumping station. A. H. Reed, clk.

Longmont, Col.—Bids are asked until Sept. 20 for furnishing and constructing a cast iron pipe line, 46,000 ft. in length, and including valves, specials, etc.; also, for a street pipe system, consisting of 60,000 ft. of cast iron pipe, with valves, hydrants, etc. Geo. H. Stonex, cy. clk.

CONTRACTS AWARDED.

Flora, Ill.—A contract for a water works system has been awarded A. M. Searles of Chicago, for $62,000.

Greenwood, Miss.—A 25-yr. franchise has been granted C. E. Wright for a water works, sewerage and electric plant.

Canajoharie, N. Y.—J. M. Johnson of Millersburg was granted a franchise for a water works system in this city.

Wills Point, Tex.—J. W. Moxey of Houston was awarded a contract for water works system in this place, for $35,000.

Linton, Ind.—A franchise for building

water works has been granted to F. H. Beman, 658 Third-st., Louisville, Ky.

Paris, Mo.—The contract for a water works and electric light plant was awarded to J. A. Ben Duse of Atchison, Kas., for $21,600.

Phenix City, Ala.—(Special.)—The contract for a water works system was awarded to J. P. Miller & Co. of Chicago, for $22,524.

Mackinaw, Ill.—The contract for building a water works plant was awarded to Jacob Harmon of Peoria, Ill., for $4,494.

St. Anthony, Idaho.—A franchise for a water works and electric light plant has been granted to J. T. Sidley and Levi Carter.

Sharpsburg, Pa.—The contract for drilling six new artesian wells for the water plant was awarded to W. J. McNeil of De Haven for $3,950.

Newark, N. J.—The contract for the new storage reservoir at Cedar Grove was awarded to Stewart & Abbott of New York City for $581,217.24.

Park River, N. D.—The contract for the completion of the water works and electric light plants was awarded to Allan, Black & Co. of St. Paul for $21,000.

Salt Lake City, Utah.—(Special.)—L. C. Kelsey, cy. engr., says the contract for laying a new 24-in. water main was awarded to P. J. Moran for $46,988.50.

Brookings, S. D.—Contracts for a water works system have been awarded as follows: Fairbanks, Morse & Co., greater part of work, $36,432; building power house and chimney, J. B. Nelson & Co., Mankato, Minn., $4,993; steel tower and tank, Chicago Bridge & Iron Works, Chicago, $7,494.

BRIDGES.

Davenport, Wash.—A bridge across the Spokane river is contemplated.

Fremont, O.—Petitions are being circulated asking for a bridge north of this city.

Meadville, Pa.—A steel bridge over Muddy creek at Teeplesville has been decided upon.

Springfield, Mass.—Plans for the St. James river bridge over the New England R. R. have been submitted.

Paulding, O.—Sealed bids are asked until Sept. 12 for building several bridges, M. P. Jacobs, chm. co. com'rs.

Mankato, Minn.—Sealed bids are asked until Sept. 2 for a steel bridge over Bull Run creek. Ed Weaver, co. audt.

Decatur, Ind.—Sealed bids are asked until Sept. 2 for constructing 13 steel bridges. Sam'l Doak, chmn. co. com'rs.

Springfield, O.—Sealed bids are asked until Sept. 7 for a steel or iron bridge over Mad river. A. H. Kuhn, co. audt.

Weiser, Idaho.—Bids are asked until Sept. 8 for a highway bridge over Weiser river. I. F. Smith, clk. co. com'rs.

Houston, Tex.—A new bridge over the bayou between the present San Jacinto st. bridge and the Santa Fe Ry. bridge is desired. Co. com'rs.

Hamilton, O.—Sealed bids are asked until Sept. 13 for one abutment to the bridge site over Darr's run at Kyger Farm. H. C. Grey, co. audt.

Pratt City, Ala.—Bids are asked until Sept. 10 for a steel bridge across Village creek. B. F. B. Jackson, ch. supv. of roads and bridges.

Toledo, O.—Sealed bids are asked until Sept. 3 for rebuilding abutment of Lafayette-st. bridge. R. D. Potter, supt. and harbor master.

Zanesville, O.—Sealed bids are asked until Sept. 10 for the superstructure of a bridge over the lateral canal of the Muskingum river. Jas. L. Starkey, co. audt.

Mt. Idaho, Idaho—In October the county commissioners will let the contract to repair Salmon river wagon bridge, recently examined by Ernest McCullough, C. E., of Lewiston, Idaho.

Indianapolis, Ind.—Sealed bids are asked until Sept. 9 for bridges over Little Lick and Crooked Creek and a concrete arch over Rayburn ditch. Jas. E. Greer, chm. co. com'rs.

DeKalb, Ill.—(Special.)—Walter M. Hay, cy. engr., says that W. M. Hughes, C. E., Chicago, is preparing plans for a plate girder bridge, 70-ft. span, and with concrete floor and brick paved for the trustees of the Northern Illinois State Normal School over the Kishwaukee river here at DeKalb. Plans will be ready by Sept. 1. A. A. Goodrich, 627 Rookery, Chicago, Prest. Board of Trustees of the Normal School.

PARKS.

Augusta, Ga.—The question of transforming the old settling basin into a park is being considered.

Cedar Rapids, Ia.—The council favors the purchase of fifty acres along West river bank for a new West Side park.

Akron, O.—O. S. Barber of the Diamond Match company has announced his intention of giving a park of 200 acres to the town of Barberton.

Chicago, Ill.—Petitions are being submitted to the South Side park board for the establishment of small parks in the Thirty-first and Thirty-second wards. Englewood has petitioned for two small parks.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Baker City, Or.—The question of street sprinkling is being considered.

Sayville (L. I.), N. Y.—Walter L. Suydam, a contractor, is testing petroleum for sprinkling purposes.

New York City—The Stanley Garbage Disposal company has been incorporated by J. C. W. Stanley and A. P. Nevin.

Oakland, Cal.—Bids are asked until Sept. 4 for sweeping and cleaning certain streets by machinery. R. F. Jackson, secy. bd.

Hamilton, O.—Sealed bids are asked until Sept. 10 for a crematory of twenty tons capacity a day. M. O. Burns, cy. clk.

Allentown, Pa.—Bids were received Aug. 6 for a crematory as follows: Dixon Garbage Crematory company, Toledo, O., steel-shell crematory, with a furnace 38 ft. long, 8¼ ft. wide and 9⅝ ft. high, 25 tons capacity a day, $13,950 with steel stack, $14,550

with part steel and part brick stack, $15,585 for full brick stack, building included; Bridgeport boiler works, Bridgeport, Conn., Smith two-crib crematory, with steel stack, 100 ft. high, 20 to 25 tons capacity, $6,550, with brick stack, $7,400, without building; wooden building, $2,000, or brick $4,150.

STREET LIGHTING.

Monaca, Pa.—The question of street lighting is being discussed.

Media, Pa.—Bids will be asked until Sept. 3 for an electric light plant.

Dolgeville, N. Y.—The electric light plant will be sold by the sheriff Sept. 17.

Cleveland, Tenn.—This city is considering a different system of electric lighting.

Muskegon, Mich.—Plans for a new plant for the Muskegon Traction & Lighting company have been prepared.

Cuyahoga Falls, O.—Plans are being discussed for increasing the facilities at the electric light plant.

Madison, Wis.—A resolution is pending to investigate private and municipal lighting plants in other cities.

Warren, Mass.—Plans for changing the electric system from arc to incandescent are being considered.

Fayetteville, N. C.—A contract has been awarded the Cape Fear Electric Power company for $2,000 per year.

La Crosse, Wis.—A contract for lighting the business houses on Front-st. has been awarded to Thomas Benton & Son.

Eveleth, Minn.—A franchise has been granted Alexander Hughes and associates for an electric light plant.

Clyde, N. Y.—The offer of the Clyde electric and power company to furnish streets lights at $50 per lamp, until 1 a. m. has been accepted.

Wilmington, Del.—The contract for an electric light plant has been awarded to the American supply and constructing company for $8,500.

Streator, Ill.—A contract for lighting the street has been awarded to the Streator gas and light company for 5 years at $82.00 per lamp per annum.

Shepherdstown, W. Va.—The contract for an electric light plant has been awarded to the Jacob G. Schaff electric company of Chambersburg, Pa., for $4,350.

Baker City, Ore.—A petition is being circulated among the business men asking the council to accept the offer of the electric company to provide illumination.

McIntosh, Minn.—A twenty-year franchise for an electric light plant will be granted, the bids being received until 8 p. m., Sept. 9. Owen Nelson, vil. recorder.

Electric light plants are contemplated at the following places: Colrain, Mass.; Booneville, N. Y.; Sharon, Tenn.; Rosebud, Tex.; Cedarsburg, Wis.; Wautoma, Wis.; Lincoln, Ill.; Windfall, Ind.; Stewartsville, Minn.; Holley, N. Y.; Airy, N. C.; Bradner, O.; Merrillan, Wis.; Washington, Ia.

TOO LATE FOR CLASSIFICATION

Alexandria, Va.—Brick paving is contemplated for King and Alford-sts.

Adrian, Mich.—Bids will be asked, according to press reports, for paving S. Main-st. with asphalt.

Whatcom, Wash.—The construction of a new water main from Lake Whatcom to this city is contemplated.

Sault Ste. Marie, Mich.—The contract for a new sewerage system was awarded to Jas. E. Whalen, for $50,000.

Quakertown, Pa.—An ordinance was passed, Aug. 22, for curbing and paving Erie-ave. east of Ambler.

Nampa, Idaho.—Plans for a large power plant, to be installed at American Falls, are being prepared by R. W. Faris.

Belvidere, Ill.—A resolution was prepared, Aug. 19, for building a sewer on N. State-st. Mayor Swift.

Omaha, Neb.—Sealed bids are asked until 2 p. m. Sept. ., for grading Grover-st. Wm. Coburn, sec'y. B. P. W.

St. Joseph, Mo.—An ordinance has been passed for paving Jule-st. with brick, with curbing, guttering and brick walks.

Hammond, Ind.—The contract for paving Rinebach-ave. was awarded, Aug. 20, to C. L. James, at $1.65 a sq. yd. with Indiana block.

Bay City, Mich.—Bids will be received until 7:30 p. m. Sept. 3, for a sewer on Elm-st., from N. Union to Mosher. Mayor Lind.

LaSalle, Ill.—Sewers are contemplated in the new Marquette-st. addition, Creve Coeur-st., and certain alleys. Mayor Charley.

Youngstown, O.—Sealed bids are asked until 12 m. Sept. 14, for paving Yale-ave. and Chapel, Basin and Champion-sts. C. E. Cross, clk.

Denver, Colo.—Plans for a new sidewalk district, to be known as No. 7, have been prepared. Concrete is favored by the property owners.

Peoria, Ill.—The city engineer has been directed to prepare new estimates for paving Peoria-ave., providing for brick paving on gravel base.

San Antonio, Tex.—A resolution was adopted, Aug. 19, for macadamizing Crockett-st., from Live Oak to Pine. E. G. Truehart, cy. engr.

Charleston, Ill.—An ordinance has been passed providing for the construction of cement walks on Van Buren-st. J. W. Ramsey, mayor; D. C. Merritt, cy. clk.

Aurora, Ill.—An ordinance was passed, Aug. 19, providing for a sewer and water main on S. Fourth-st. and W. Park-ave., and for a number of brick cross walks.

Moline, Ill.—The contract for brick paving on Sixteenth and Eleventh-sts. was awarded to the Tri-City Construction Co., of Davenport, Ia., for $16,300.

Ottawa, Ill.—The purchase of a road grader and steam drill, or other machinery for building roads, is contemplated. M. F. Moloney, mayor; Howard Farnsworth, cy. clk.

Sullivan, Ind.—Sealed bids are asked until 2 p. m. Sept. 2, for a complete system of water supply, soil, waste and ventilating pipes. Wm. M. Bennett, chm. bd. com'rs.

Allegheny, Pa.—Sealed bids are asked until 12 m. Sept. 11, for the permanent improvement of the Saltsburg road and the Peoples Plank road. W. E. Thompson, co. controller.

Goshen, Ind.—A franchise was granted to Wilbur L. Stone, Aug. 19, to establish a hot water heating plant, to be owned and operated by the city as a municipal heating plant.

Ludlow, Ill.—The village board voted, Aug. 19, to have concrete walks built in all of the principal streets. The ordinance provides for 4,000-lin. ft. of concrete walks.

College Hill, Pa.—The contract for an electric light plant was awarded, Aug. 21, to Jas. R. Ridinger, representing the Iron City Engineering Co., of Pittsburg, for $10,000.

Kenosha, Wis.—Sealed bids are asked until 8 p. m. Sept. 3, for building sewers on Jenne, Grover and Quince-sts., with manholes, catch basins, etc. Gus Jacob, cy. clk.

Ft. Worth, Tex.—The contract between this city and D. W. Meade, of Chicago, for a 3,000,000-gal. artesian water supply daily, has been signed, and work on the wells will begin at once.

Salem, O.—The city engineer was directed, Aug. 20, to prepare plans and specifications for paving a number of streets with asphalt, blocks and brick. Morris French, cy. engr.

Cortland, N. Y.—The owners of the Grand Central block and the adjoining property propose to pave the alley in the rear of the buildings with brick. Bids will be asked soon.

Glenville, O.—Sealed bids are asked until 12 m. Sept. 18, for paving with trap rock on broken limestone, and constructing storm water sewers in a number of streets. Ira C. Farley, vil. clk.

Hartford City, Ind.—Sealed bids are asked until 7 p. m. Sept. 6, for curbing Grant-st. and constructing brick walks on each side, from Race to Richmond; also, for the construction of a generaal sewer on Grant-st. R. L. Manor, cy. clk.

Superior, Wis.—Bids were received, Aug. 20, for lighting the streets, from the Superior Water, Light and Power Co., and the American Development Co. The bids were referred to the committee on lighting.

St. Paul, Minn.—A resolution was passed, Aug. 20, annulling the final order for paving S. Wabasha-st. with brick, and substituting asphalt, in accordance with the petition of the property owners.

Hartford, Conn.—Bids were received, Aug. 21, for constructing the Franklin-ave. sewer outlet into the Connecticut river at Wetherfield Cave, as follows: Chas. H. Slocomb, $2,808; E. R. Patterson, $2,740. Both bids were rejected and new bids will be asked.

Detroit, Mich.—The contract for paving Beaubien-st., from the boulevard to Bethune-ave., with cedar blocks, was awarded to T. J. Kennedy at $1.48 a sq. yd., and for Nineteenth-st. from Fort to Newark, The E. K. Roberts Co., at $1.58 a sq. yd.

Kansas City, Mo.—Sealed bids are asked until 2 p. m. Sept. 4 for grading North Terrace Park and Lydia-ave. Geo. E. Kessler, sec'y. park bd. The residents on the South Side have petitioned the park board to ask for the condemnation of land at Twenty-seventh-st. and Woodland-ave. for park purposes.

Marion, Ind.—Bids are asked until Sept. 17, for constructing brick sidewalks on Spencer-ave., from G-st. to Butler-ave. The contract for constructing the Sixth-st. sewer was awarded to F. M. Benner, and the contract for improving First-st. from Butler-ave. to Geneva-st. was awarded to Joseph Garnett, at $2.69 a sq. yd.

Bay City, Mich.—Resolutions were adopted, Aug. 19, for building a 10-in. tile sewer in an alley, and building stone cross walks on Fourteenth and Farragut-sts. The board of public works favors asphalt block paving for Van Buren-st., and the residents of the street want asphalt. The matter was laid over for two weeks.

Lincoln ,Neb.—Contracts for repairing in two districts were awarded, Aug. 21, as follows: S. Eleventh-st., from J to D, asphalt paving with brick gutters, R. F. Conway Co., of Chicago, $1.69 a sq. yd.; P-st. from Eleventh to Fourteenth, and Twelfth and Thirteenth-sts., from O to P., Barber Asphalt Paving Co., $1.58 a sq. yd., and $1.83 a sq. yd. for the intersection at Thirteenth and N-sts.

Erie, Pa.—The recommendations of the Mill Creek Commission have been adopted, and an ordinance authorized abolishing the nuisance. The report stated that F. W. Farquhar, of New York City, Geo. S. Pierson, of Kalamazoo, Mich., and Charles Carroll Brown, of Indianapolis, Ind., all agree that a sewer or sewers should be built on one or both sides of creek, and a sewage disposal plant should be constructed near its mouth. A small plant, not to exceed $20,000 in cost for experimental purposes, and a brick sewer at about $17,000, is recommended. The estimated cost of the completed sewage disposal plant is $170,000.

Houston, Tex.—Bids were received, Aug. 19, for paving a number of streets with asphalt and brick. According to the press reports the bid of Hipp & Key seemed to be the lowest submitted on asphalt, which ranged from $1.75 for 4-in. concrete hase to $2.10 for 6-in. concrete base. The Ubalde Asphalt Co's. bid ranged from $1.95 for 4-in. to $2.20 for 6-in. concrete base. The bids submitted on brick ranged from $1.80 to $2.50 a sq. yd. on American hydraulic natural cement base; from $1.90 to $2.25 on gravel and Portland cement concrete base; $1.90 to $2.20 on broken stone and American natural hydraulic cement concrete base; from $1.89 to $2.57 on broken stone and Portland cement base; from $1.60 to $1.96 on gravel base; from $1.37 to $1.80 on sand foundation; from $1.65 to $1.95 on second course of brick. The bids on Telford macadam paving ranged from $1.25 to $1.40, and on gravel, from 89 cts. to $1.05. The bids were referred to the board of public works.

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